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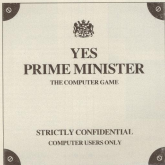
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DATA STATEMENTS



Sport for All

Electronic Arts has recently released a whole host of sports games for the C64, so here's a quick run down of what's available.

Skate or Die is on C64 cassette (£9.95) and disk (£14.95). It's a skateboard simulation in which you have to compete in five different competitions. The contests are modelled on real championships and feature events like Ramp Freestyle, Downhill Race and Ramp Hill Jump.

Mini-Putt for the C64 cassette £9.95 and disk (£14.95) is a crazy golf game in which nothing is as it seems. A smooth green can suddenly come to life and gobble your golf ball!

Top Drive is a driving simulation which lets you experience the thrill of driving some of the world's top cars including a Ferrari Testarossa and a Lamborghini Countach. The simulation displays the interior of the

car and the road to give the feel of a real test drive and the object of the game is to drive sections of the road within a given time limit.

Top Drive is available for the C64 at £9.95 cassette and £14.95 disk and is also out on the Amiga at £14.95.

Commodore has announced the release of an Amiga Sports Pack and a Commodore 64 Sports Pack. Each pack contains an assortment of sports games, a full size career bag and a 'Win a day at Chelsea' competition.

For more:
Electronic Arts: Langley Business Centre, 11-19 Station Road, Langley, or Slough, Berks. SL3 8YK. Tel: 0753 49442.

Commodore: Commodore House, The Switchback, Gardner Road, Maidenhead, Berks SL6 7LA. Tel: 0629 778985.

Television Tie-ins

There has been a sudden spurt of TV related titles in the last few weeks.

First, Music Publishing is launching *Top Prime Minister*, a game launched on one of the most popular comedy programs of recent years.

The player takes the part of Jim Hacker and must raise his standing in the polls during five days of turmoil and stress.

The game is available on C64 cassette at £14.95 and disk at £19.95.

TV games, Domark's new label, has announced the launch of three new titles for the C64. All based on popular television shows, the games are *Countdown*, *Redgrave and Tennant Meet*, and all feature many of the familiar aspects of their counterparts on the box. All will cost £7.95.

For more:

Music: *Quincy* First, *Quincy* Quincy, *Findingbridge*, Harps SP9 1PS. Tel: 0429 37843.

Domark: Domark House, 22 Marshfield Road, Wembley, London HA9 7JA. Tel: 01 947 5622.



DATA STATEMENTS

Generally Speaking

The UK's first Technology Graduate Recruitment fair is to be held at the National Museum, South 4-6 January, 1988.

Chris Brown, of organisers, Intra UK, said: "Since launching the fair, we have been very pleased by the initial take up of stands." Companies committed to appearing include Barclay's Bank, ICB, Dow Chemical, Thames Water Authority and Rank Xerox.

Exhibitors are hoping to attract graduates with technology and computing backgrounds at the specialist event.

Also relevant to those interested in computers, is the Data Protection Act 1984. The final elements of the Act came into force in November and will affect everyone in the UK.

For the first time, every man, woman and child has the legal right to see what is held on computer files about themselves and where appropriate to have the information corrected. It also gives individual the right to compensation under certain circumstances.

Lives can be seriously affected if inaccurate data is held about individuals. For instance, credit worthiness could be undermined or employment prospects blocked.

For further information about the Act and your rights under it, contact the Office of the Data Protection Registrar at the address in Touchline.

Touchline:
John UK: Chris Paul House, Croydon Road, Aylesbury, Bucks HP8 7PR. Tel: 0494 551000.

Office of the Data Protection Registrar:
Springfield House, Water Lane, Wilmslow, Cheshire SK9 5AJ. Tel: 0625 537711.

In the Arcade

Danmark, always on the lookout for big licensing deals, has just released a C64 version of Star Wars. The game is a conversion from the original licensed Atari coin-op game and boasts a close resemblance to it.

You select your own difficulty level and then you're placed in charge of an X-wing fighter and are ready to fight the forces of the evil Dark Vader. The C64 console version is £9.95, and the disk version is £10.95.

Amiga News

The Amiga 500 has been reduced in price by Commodore to £499.99 including VAT. The announcement came recently after weeks of speculation over the pricing of the Amiga 500, the smallest machine in the Amiga range.

Boxed with the computer, and included in the price, are Deluxe Paint from Electronic Arts and The Guy first tutorial pack.

Tom Hart, National Sales Manager, Consumer Products Division, said: "We believe that £499.99 inclusive of VAT offers a significant incentive to the consumer during the Christmas period and the months ahead. This is the only price change both are for the remainder of 1987 and for the foreseeable future."

Software is still being launched thick and fast for the Amiga range, a large percentage coming from US companies. Electronic Arts is no exception, having recently announced the arrival of four new Amiga products.

Three of these are musical. *Amiga! Music!* (£24.95) allows even a novice to compose and play impressive sounding pieces. The program uses a non-standard form of musical notation which, it is claimed by EA, is exceptionally easy to read and a remarkable user interface to make creating music as easy as possible. *Now will Amiga! Music* ever let the user play out of tune or out of rhythm.

The two other musical products are library disks to accompany *Amiga! Music!* These are: *It's Only Rock 'N' Roll* and *Hot and Cool* Jazzy. Both will retail at £9.99.

The fourth EA Amiga release is *Earl Weaver Baseball*, a sports simulation re-written by two top

baseball managers Earl Weaver and Eddie Dierkerbauer.

The arcade mode of the game is a challenging sophisticated simulation which features high resolution graphics and realistic digital sound. However, there is a major strategic element to the game, in that players can step into the manager's shoes to set line-ups, trade and draft players, sack pitchers and outwit a variety of opponents including Earl Weaver himself. Players also get the chance to design their own baseball park. The game is priced at £24.95.

Sentinel Software has announced a price reduction for the *Wind Projector* Amiga word processor. Formerly £255, the program will now sell at £199.

Sentinel is also considering its trade in offer to *Scrabble* owners. Anyone currently using *Scrabble* can obtain a C60 refund off the cost of *Wind Projector* changes. Simply send your old master disk and manual with a copy of your invoice for *Wind Projector* design to Sentinel Software at the address in Touchline and you will get a C60 refund.

Touchline:

Commodore Consumer Store: The Touchline Co., Grafton Road, Maidenhead, Berks. MK4 7TA. Tel: 0628 778000.

Electronic Arts Computer Resources Centre: 11-15 Station Road, Tangley, New South, Berks MK18 1B. Tel: 0773 44442.

Sentinel Software: Wellington House, New Zealand Avenue, Watlington, Oxfordshire. Tel: 07771 251164.





Richard Hanson, Managing Director of Superior Software gets to grips with *Bomarcruiser*.

Denmark is also planning future games based on the films *The Empire Strikes Back* and *The Return of the Jedi*.

Octopoli is a new arcade game from English Software. Set in the year 2087 the small planet of Octopoli is faced with the might of the Imperium. Luckily a secret weapon is available, enormous mental power. No enemy ship could approach and expect its crew to remain sane and sensible.

However the Imperium secret service has been trying to find a space pilot who would penetrate the zone around the planet and find a way through, so that Octopoli could be wiped out. Now a hero has been found and it's you.

Game features include split screen two way perspective scrolling, 40 detailed play a min and sound effects to match. It costs £9.99 for C64 cassette and £12.99 for the disk.

Imagine has released *Freddie Hardest*, an arcade action game for the C64 (£8.99 cassette and £12.95 disk). The game originated from Spanish software house Dinamic.

Freddie Hardest is a counter-espionage agent, skilled in martial arts and laser weaponry. However, Freddie habitually drinks too much and one night manages to crash his space ship on an enemy planet. The only way to save things is to fly back an enemy space ship without being killed by human-replicable mutants, immune to laser fire.

Microsoft has released a new Tony Crowther game for the C64 on disk (£12.99) and tape (£9.99). The game is called *Zig Zag* and is set in the twelfth dimension. As a trainee space pilot, you must face the ultimate challenge, the Matrix of Zig. Created to find the supreme space pilot, it has yet to fulfil

its purpose. Your aim is to find the eight crystals of Zig and escape to what lies beyond the Matrix.

As an incentive to would-be super-players, Microsoft is offering a ghost-buster signed by Tony Crowther to the



first five players who finish and discover the code on the hi-score table.

Superior Software is also offering prizes to accomplished games players. *Bomarcruiser* is Superior's new arcade adventure for the C64 (£9.99 cassette and £11.95 disk) and the Amiga (£14.95). Bono is a baby dragon who runs a bath house in the depths of the sea for monsters fed up of stagnant water. Unfortunately, the bath attracts some undesirable who love to eat baby dragons most.

The competition can be won by anyone who finished the game. Each player who completes *Bomarcruiser* successfully can claim a portable radio complete with headphones, a Bono badge and a winner's certificate.

In the of *this World*, on the Realtek label, you (Chuck Harrison) and your C64 can R/2-D fighters go find yourselves in *The Other World* and have to negotiate eight levels, seven bonus levels and hostile enemy ships in order to make the outer reaches. The game is available on cassette and disk at £9.99 and £12.99.

Electronic Arts has launched *Demon Slayer*, a one or two player arcade game for the C64.

Demon Slayer contains 99 levels of grueling mazes, all with different goals, messages, monsters and magic. And level 100 contains Calibar, the Demon, ready to battle with unarmoured intruders. On each level are many useful items but you have no way of knowing if they are good or evil so be prepared to take risks. The cassette version of the game is £9.95 and the disk version costs £14.95.

Touchline:

Denmark: Denmark House, 23 Mansfield Road, Wimpole, London NW19 7JA. Tel: 01-667 5823.

English Software: 1 North Parade, Fortham, Gorton, Manchester M17 7NL. Tel: 061 833 1258.

Imagine: 6 Central Street, Manchester M2 3LS. Tel: 061 854 1819.

Microsoft: Atlantic House, 66/71 Silver Lane, London EC4P 4AB. Tel: 07 377 4673.

Superior Software: Regent House, Silver Lane, Leeds, LS7 1AT. Tel: 0113 289413.

Realtek: 8 Danforth Road, Pinner, London SW13 2DR. Tel: 81-785 4281.
Electronic Arts: Langley Business Centre, 11-49 Sutton Road, Langley, Nr Slough, Berkshire SL3 8TN. Tel: 0753 49442.

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Solid Gold

Go for gold in the latest in game compilations.

By Tony Motherington

Compilations come and go and offer you a gaggle of goodies for the price of one game. They usually consist of one short tapper, two also runs and a few lions. So the usual advice from reviewers is to buy it if you haven't already got the good game. Now US Gold has changed all that with Solid Gold, a compilation of five

great games. Now the advice is simple - buy it!

Granfleet leads the impressive line-up that also includes the combat flight simulator Ace of Aces, the original version of Lander Board, the best of the "arena" sports games, Winter Games, and IceHitter which is a flight simulator, commando game and

stealth adventure all rolled into one.

Granfleet took the coveted Christmas number one spot and is the successor of the classic coin-op machine that was so popular that a dot for 40 coins was specially fitted so no players could cheat in their money. The C64 version captured the excitement of the battles of a warrior,





which, if not sublimated at times against ghosts, gnomes, robbers, sorcerers and the aptly named dragons as they bravely delve deeper into the dungeons.

A staggering 512 levels packed with monsters and monsters lay ahead as they search for treasure. Keys to open doors, magic potions, amulets of invincibility and food to top up their health points. As monsters munch you and poisons drain you then the health points are lost. Run out of health points and you run out of game.

Caesar is a fast and furious game that's played in a state of semi-controlled panic by players that once bitten, are hooked for hours and hours. Undoubtedly, the pick of the coin-op conversions.

Are of Aces takes you to the skies in the pilot seat of a Mustang fighter bomber. The game begins in the briefing room where you can choose to bomb a POW train carrying prisoners to Berlin, attack submarines before they escape to the open sea, deflect V1 rockets from their deadly course to London or delight with a squadron of 100's. If you want to become the Ace of Aces you will have to attempt all that at once!

Once airborne you certainly have your work cut out as you have to plot your course to the target, control both engines, select between guns, rockets and bomb weapons and fight off attacking MiG 109's.

Leader Board was the first of a series of four golf games from Access, the people who brought you subtle games such as the swimming Beach Head II and Rind over Moscow. Despite the lack of shoes and kilt (the normal Access trademark) the Leader Board courses can be vicious particularly to novice golfers.

Unlike other golf simulations that pointlessly over club selection and fine angles Leader Board is a LOAD and go game.

Hit and Hope tactics seem to work as well as any other which makes it a real games players' game which probably explains why it shot straight into the number spot in the charts.

The courses are a bit limited and consist of islands set in a massive lake so if you manage to stay out of the drink you'll probably get a good score. If you enjoy Leader Board then it's probably worth investing in one of its three sequels. Leader Board Tournament added four new but equally wet courses, the Executive version dried out the course and added trees and bushes and finally World Class Leader Board is the definitive version complete with a topdown map of each hole.

Winter Games was the third in the Eyes "Games" series that began with Summer Games 1 and 2 and has once continued with World Games and recently California Games. Winter Games, another chart topper, is still my favourite.

Overlaid events push joystick athletes to their limits as they go for gold in the ice and snow.

Superb graphics form the

backdrop for events such as the ski jump and bobsled as well as the curious Hot Dog Arch in which contenders must perform acrobatics while leaping off a ski slope! Skiing comes in the three varieties of speed, figure and free but the most grueling event has got to be the bobsled. This is a cross country race against time in which you must also shoot targets to get a good score and a chance of a medal. After the bobsled, the 1500m will be easy.

Last but no means least Inflatable casts you as Johnny "Dumbo-Baby" McWhiffen as you sit off in your super helicopter to save the world once again. This time the Mad Leader is up to his old tricks again and you must stop him.

In the first of three missions you must fly your Whirling Enterprises Glomo Attack helicopter through enemy airspace then land and infiltrate the enemy base. With only your usual toolkit of sleeping gas, fake papers and gas grenades you must search the base and photograph the Mad Leader's plans and then escape back to base. This mission leads you through a combat simulator to a commando strike mode adventure and back again in one amazing game.

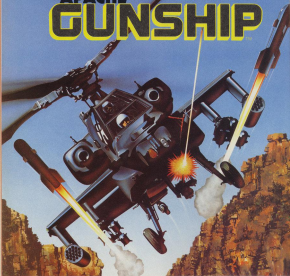
Each of these games is a classic in its right but together for only £5.99 they are pure solid gold.

Finalities:

Title: Solid Gold, Supplies: US stock, 117, Redwood Way, Bedford, Birmingham B6 7EL. Tel: 076-04 1285. Machine: C64. Price: £9.99 (incl. £14.99 del). Originity: 4/18. Playability: 8/10. Graphics: 8/10. Value: 10/10.



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Byting into the 6510

This month we continue our typewriter program in machine code by adding an interrupt driven cursor and find out more about the machine itself.

Ry Burghard-Henry Lehman

Personally, I consider the most exciting thing about computers is their tremendous flexibility. Even though they are only machines, they are the most versatile kind ever invented. This opens the way for unlimited creativity, and at the end of the day, a computer is as good as what you make of it.

For example, you may be forgiven for thinking that since you bought yourself a Commodore 64 you are lumbered with a slow and pretty limited basic for ever. But the moment you learn something about how flexible the machine really is, you'll find that this is only the tip of the iceberg. The deeper you get into the C64, the more you will discover that it has been designed in ways which literally beg you to make more out of it. In the end you could change your computer so completely that you could have a brand new computer every week! And this is not really as difficult as you might think. In fact, the designers of the C64 made use of that in several ways.

In the following article we will discover a powerful way of changing your C64 considering the use of vectors.

Vectors

In the last article in this series I told you a little about the maskable interrupt which is called upon every 40th of a second and enables the computer to read the keyboard and print the flashing cursor. Now we want to use this knowledge and create our own cursor.

First of all, let's look at exactly what happens every 40th of a second.

Each time the interrupt is called the microprocessor is made to jump to the last location of the C64 which is hex FF7E or decimal 65518. Actually, it's not really jumping to this address, but using this uppermost location to find out where to jump to next. (You might like to know that all processors of the 6501 family, to which the 6510 belongs, are programmed to read the vector at 65518. But from there all machines take different routes).

So this is what a "vector" is all about. It is very similar to what we have already learned when dealing with indirect addressing—the contents of two locations point the microprocessor to the address of another location.

The vector at the top of the C64 tells the 6510 to jump to a routine at hex FF46, decimal 65502. This is the start of the interrupt routine and begins with the 6510 saving the contents of all its registers and so afterwards, it can continue with whatever it was doing before. It is then made to jump via another vector.

This vector is located in RAM, at hex 8214 or decimal 33216, and is the one which interests us most. Because it is located in RAM we can change it and thus make the 6510 jump to our routine, instead of the usual routine in ROM.

Driving a Wedge

Vectors are very useful because they permit flexibility in the design of a micro. When a computer first comes onto the market the operating system is seldom as fully developed as hoped. There are very often bugs present (the

people who program the operating system are just as fallible as the rest of us...) It is also very likely that the designer comes up with ideas for improved facilities.

Without vectors these changes in the operating system would mean that the whole program would have to be re-written completely. It would also mean that some of the hardware of the computer might have to be re-designed and this would result in a lot of very unhappy people who have spent their hard-earned money on a brand new micro, only to find themselves with a very short time latched with a machine which is hopelessly out of date. This problem can be solved by using vectors which are fixed locations, either in RAM or in ROM. All that has to be changed now is the contents of the vector location, which makes the microprocessor jump to the new or modified routine.

Vectors are also very useful in the humble programmer. If a vector is in RAM, he can change it and make the microprocessor jump to his routine instead of the one in the operating system. This is called "driving a wedge", and is used by all the extended Basic programs available for the C64.

We will also use this method, for programming our own cursor.

Turning the Cursor On

The interrupt routine which I have run into a separate source file (located at 50000) — see listing 2) consists of three routines:

- ◆ the routine, which turns our cursor on.
- ◆ the routine, which turns it off.

the interrupt routine itself, which is called upon every 60th of a second via the vector at \$0114.

"Turning the cursor off" could sound a little misleading, as we don't inhibit (turn anything on or off). All we do is change the vector at \$0114. But for our purpose this means, that from then on our cursor is "turned off", in the sense that the computer will now jump to our routine instead of the one in KernelROM which is located at \$E43H.

Later on, when we "turn the cursor off", we will do the opposite, i.e., change the vector back to normal.

As you can see from lines 158 and 160 (and 158 and 160, respectively), I have introduced two new op-code mnemonics: "SET" and "CLR". You may remember that in the last article I said that we are dealing with a "maskable interrupt", that is an interrupt which can be turned on and off by software.

This is exactly what "SET" and "CLR" do: "SET", which stands for "Set Interrupt flag", disables the interrupt. "CLR", which stands for "Clear Interrupt flag", enables it. The interrupt flag is bit 0 of the flag register of the 6502. If this flag is clear (0), the microprocessor executes the interrupt every 60th of a second. If it is set (1), it doesn't.

It is very important to disable the interrupt while we make the 6510 change the vector. Remember, in the time which it takes you to read lines 160 to 166 in our program listing, the 6510 will have called the interrupt at least 500 times! So it could easily change part of the vector at \$0114 and then jump to the interrupt, using the same vector which it has just partially changed. This would result of course in it jumping to somewhere quite non-sensical! And this, in all likelihood, will mean a complete crash!

So we have to prevent the 6510 from following the interrupt while it is changing the vector.

In lines 210 to 216 I set the two variables ("CURSPFLAG" and "COUNT"), which will be used in the interrupt routine itself. More about this in a minute.

Flashing the Cursor

What does "flashing the cursor" mean? (and I am not thinking of the possible roughly connotations...)

In short notation it means that there are two states in which a charac-

teristic on the screen can be: in the normal C64 mode you either have the character at that position printed normally or in reverse. The flashing effect comes from the machine alternating between these two states.

What happens is very simple - some of the time the interrupt is called, it prints the character in normal, while the rest of the time it prints it in reverse.

If it alternated between these two every 60th of a second, it would happen so quickly that you wouldn't be able to see the cursor. All you would get at that position is a bad case of flicker.

Therefore we have to introduce a timing device to make it alternate about once a second. This is what the variable "COUNT" is all about, which I introduced in lines 210-216. Of course, by changing the value in "COUNT" you could easily change the timespan to suit your taste!

It starts off with "COUNT" = 0. And every time the interrupt is called, this is bumped up by one (line 580). Then it is loaded into the accumulator and compared with 20 (lines 585-600). If it doesn't equal 20, the program exits straight away to line 590 (JMP \$E43H makes it jump to the rest of the normal interrupt routine in the Kernel, which makes it read the keyboard as usual).

If it reaches 20, first, "COUNT" is reset to zero (lines 600-605), ready for the next go. Then it tests a variable which I have called "CURSPFLAG". This contains either 0 or 1.

If "CURSPFLAG" contains zero, the character "under the cursor" is reversed, by adding 128 to it (lines 740-800).

If "CURSPFLAG" contains one, the character is put back to normal by subtracting 128 (lines 840-900). (I hope that you are aware, that you can do this with all screen codes, simply by adding or subtracting 128 to it...)

This is all there is to our cursor routine, except that every time "CURSPFLAG" is zero, we clear or reset it. Don't think me too pedantic mentioning this little matter, because if you overlook it I can assure you the computer won't! And this will result in the cursor being off most of the time, which means you won't have a cursor!

Turning the Cursor Off

As I've said already, lines 118-166 turn our cursor off by changing the vector at \$0114 back to normal.

I mention this specifically, because if you use your own interrupt routine you should always turn it off, when you don't need it any more!

The first reason for this is that your interrupt routine might slow other operations down, such as loading or saving to disk or tape, especially if your interrupt routine is longer than the one in ROM.

Secondly, it is easy to forget that your routine will indeed be executed every 60th of a second! Therefore, some of the variables which you use in the interrupt routine might be used by the operating system or by the program you are running in the meantime.

For example, if you use my "Speedy Assembler" routine (which the article plugs), you should always turn off any interrupt routines you are experimenting with, before reassembling them. And above all, take care to reset all vectors as they were before "Speedy Assembler", like many other programs of this kind, changes some of the registers for its own purposes. If you want to be safe, exit from the assembler, run your program and then re-enter "Speedy Assembler" by typing "SAS 22023".

Introducing a Textfile

Having created our very own cursor (and I hope you will feel free to experiment with different versions) we now want to expand our (pre-processor) routine in order to get our cursor working in all its aspects.

Figure 1
SET=SET Interrupt flag
CLR=CLR Interrupt flag
PILA=Push contents of the Accumulator
PIPR=Push contents of the Processor status register
PLA=Pull contents of the Accumulator
PLP=Pull contents of the Processor status register

The main program in Listing 1 is similar to my last one, apart from the fact that I've added quite a few facilities to it, which makes our program more like a wordprocessor.

First of all, I have introduced a textfile which is useful for saving the text we have written and also sending it

to the printer later on. A textfile is an area in memory (in my case starting from \$8000 but you can change this to any location which suits you) which stores the printable characters we have typed. In lines 144-170, "TEXTFILE" is initiated, and in line 760-769 the ASCII-character which results from the keypress is put into "TEXTFILE".

The accepted way to store characters with microprocessors is in ASCII and not in the Commodore screen codes. Printers, including the Commodore printers, know nothing about screen codes, and later on you might even want to send a textfile down the line to another computer. ASCII is the standard and Commodore screen codes aren't!

Having introduced a textfile we have of course to take other routines into account. In other words, we are now dealing with two "current positions": one on the screen and one in the textfile! Both have to be updated in concert.

CURSR Left and Right

Since we have now got a cursor, we naturally need to move it! To this purpose I have built a cursor left and right facility into the program. And here I have been more clever than usual! Instead of writing two separate routines I have built both facilities nearly into the existing routine.

The idea is simple. If you move the cursor to the right, it is the same as if you enter letters - only without the letters, if you got my drift...

On the other hand, if you move the cursor to the left, it is like deleting characters - only without actually deleting anything.

Therefore, cursor right fits neatly into the normal writing routine, while cursor left goes into the deletion routine.

With the cursor routine, the only important thing is, that I don't want the cursor right ASCII-character, which is 26, to be printed on the screen, because this would give me "Z", as it happens. So whenever CURSR right is pressed, the program jumps straight to line (550) where the print position (both on screen and in the textfile) is updated.

For cursor left I had to do some modifications to the deletion routine:

First of all, in lines 144-190 I used the X-register instead of the accumulator to test for the beginning of the screen. This is because I do not want to corrupt the contents of the

accumulator, which at this point contains the result of the last keypress.

Then I used the contents in the accumulator by pushing it onto the machine stack (line 1450). (More about this in a minute). This allows me to document the print position one to the left, as usual. It suits me that it increases the character to the right too, because in this way I get rid of the cursor!

Afterwards I pull the contents of the accumulator from the machine stack (line 1540) and give it another test. If it contains 20, then it is the deletion routine, if it contains 327, then it is cursor left, which means that no further action needs to be taken. It jumps straight to the end in line 1690.

Pushing and Pulling

In the first article of this series I briefly mentioned the existence of the so-called machine stack.

The trouble with the machine stack is that, like so many others in computing, it is thought of as mysterious, and difficult. In reality, it is nothing more than another area in the computer-RAM (starting at \$0000 or decimal 256 - the next page after zero-page) which is used for storing data.

These data-bytes are simply piled on top of the other. This has the effect that the machine stack grows to the next. (Where should it grow, if you pile things on it). With keeps like this it would of course, not be a very good idea to retrieve items by pulling them from the bottom or the middle. If you do this with a pile of books, you might easily have a nasty accident. Nothing like this happens with the machine stack, but the data-byte you pull is meaningless to the computer.

So, you "push" things onto the top of the stack and you "pull" them back from the top again. The secret of the whole thing lies in the sequence in which you do all your pushing and pulling:

If you push A, B, and then C, and you want then to start pulling things again, the first thing you get is C, B, and finally A. The whole secret of using the machine stack lies in pulling first what you pushed last, and pulling last what you pushed first.

The 6502 actually has a special register - the "stack pointer", which you can program and therefore change the top of the stack, as it is perceived by the computer. But this is something for connoisseurs and kamikaze pilots. You also always have to bear in mind

the machine stack, and whether its proper functioning is vital to the proper functioning of the computer as a whole!

Because every time the 6502 jumps to a subroutine it pushes the return address onto the stack. If, at the end of that subroutine, it can't retrieve the proper address back from the stack, it is well and truly lumbered!

So, if you push something onto the stack, always be sure to pull it before you leave the subroutine you are in!

The advantage of using the stack to store things, is that it is convenient and cheap in memory. "PHA" and "PLA" tags that use only two bytes, and that's half the length you need if you store in a zero-page variable. The disadvantage arises if you are not quite certain whether you will have pulled before you exit.

For example, at the beginning of our deletion routine I could have pushed unthinkingly the contents of the accumulator onto the stack before I tested the screen position in lines 1240-1260. But this would result in the stack getting out of order every time the user presses the deletion key at the beginning of the screen. Because it would then jump straight to the end in line 1690 and this would mean that there would be no equivalent pull from the stack! This would have created the type of static machine error (but that usually takes days to find).

Unlike other microprocessors, the 6502 allows you to push only two registers onto the stack: the accumulator and the flagregister. "PHA" stands for "Push the Accumulator onto the stack", while "PLA" stands for "Pull the Accumulator from the stack". To push and pull the flag register we "PHP" and "PLP" respectively.

And Finally

Everything also in Listing 1 is very much the same as it was last time. I would like to give a special mention to lines 430 and 1560 which turn our cursor on and off and thus activate and deactivate our interrupt routine in listing 2.

I'll leave you with a little something to try for yourself. What about adding a CURSR up and down routine to our program? Here comes the only hint I am willing to give you - you have to add 40 to the screen (and textfile) position for CURSR down and subtract 40 for CURSR up.

See things on page 37.

80 Character Print Out

Improve the printing powers of your C64 to produce 80 characters per line with this handy program.

By Jens Meyer

This program enables the Commodore 64 to print 80 characters per line instead of the usual 40. It does this by using the graphics screen, and not the text screen. All inputs are directed to the graphics screen, where the letters are printed to half their normal width. Despite the fact that they are much thinner than normal letters, they are still clear and can be read easily.

The program is written entirely in machine code, but can be loaded normally and started using "RUN".

After loading, you will be asked if you want the Epton version - type 'N' for no and 'Y' for yes. If you select yes, a new version of the program starting at \$1000 will be saved to disk, enabling the user to program an Epton with a later os, if you have the necessary equipment. The Epton has some advantages to the normal version. It is much more compatible with other programs, as it is "Hidden Away" under the ROM and not stored in the Basic memory.

However, most users will select "NO". This will start the program immediately and means that you can simply save it to disk or tape with no need to program an Epton, as this

version creates the 80 column display.

The Epton option merely exists for a very small minority of people.

When the program is started, the following restrictions and changes occur:

- As the program uses the 80-Bit mode, only one colour can be used at any one time.
- The screen memory map is twice as big as usual because there are twice as many characters, and goes from \$CFCF.
- It is possible to mix upper and lower case letters and graphics because the

graphics mode is being used, and letters which are already on the screen will not be changed, even if, for example (\$HIFT)+(COMMSODOLE) are pressed. The new character set is created by using bits 0,1,4 and 5 of the letters of the old character set.

Also, there is a routine in the memory which scrolls up everything on the graphics screen by 8 pixels (one line) to imitate the scrolling upwards in the text mode.

The characters are stored in both the screen memory map and the graphics bit map.

The following table shows the use of the memory by "ROM 80".

\$C400-\$C4FF	NEW CHARACTER SET
\$C500-\$C5CF	SCREEN MEMORY MAP
\$C6D0-\$C6FF	ROUTINE FOR SCROLLING GRAPHICS
\$C7FF	PRESERVE FORE - AND BACK-GROUND COLOUR
\$DC00-\$DCFE	(\$C000-\$F0F7 IN RAM VERSION) COLOUR
\$E000-\$E0FF	(\$0000-\$7F7F IN RAM VERSION) GRAPHICS BIT MAP

But enough of all the technical details. If you want your Commodore 64 to have an 80 column display, just

use "ROM 80".

See listings on page 77.

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Controlling the 80 column video display

If you own a C128 and you're eager to learn more about the capabilities and limitations of VDC, then read

by

By Leigh Brown

It is useful to have a rudimentary knowledge of Machine Code as some of the operations that the 8563 can perform are not possible in BASIC. Also, it is important to remember that a monitor is needed for 80 columns and some people may not be able to afford the expensive Commodore monitor. I would advise those people to use a standard monochrome monitor.

The VDC has been designed to cater for most of the programmers' needs. For example, it has its own cursor and draws 16K bytes of RAM. However, it has a few drawbacks, but you should get used to these after using the VDC for a while. The first of these is the addressing of the VDC. All of the 32 registers are accessed via two locations in the Input/Output area of the computer. These locations are \$D900 and \$D901 and act as a simple Input/Output port. For example, to store 15 in register 11 you store 15 in location \$D900 and then store 15 in \$D901. And to read from register 11 you store 11 in location \$D900 and then read the value from \$D901.

Figure 1

7	6	5	4	3	2	1	0
ALT	HVS	UND	FLA	RED	GRE	BLU	INT

Figure 2

```

$D900: Reads -- < < 8 bits register select > >
Writes/Writes status: Lpen: White -----
$D901: Reads < < 8 bits for reading and writing data > >
  
```

Figure 3

Reading to and writing from registers: Using these routines, X is the register and Accumulator holds data.

write addr	STX \$D900 BIT \$D900 BPL read STX \$D901 RTS	/Write register /in VDC busy? /yes, then wait	ROM COPY AT \$CDDC
read addr 2	STX \$D900 BIT \$D900 BPL read LDA \$D901	/Write register /in VDC busy? /yes, then wait	ROM COPY AT \$CDDA

Location \$D600 also has some other uses when read. Bit 7 returns the status of the VDC, in other words whether it is busy or not, as some operations take some time. Bit 6 is used for the light pen, which doesn't concern us. Bit 5 is the vertical flyback bit, so you can synchronize events to the monitor or alter the screen without flickering occurring.

The 16k RAM of VDC

As mentioned before the VDC 'owns' its very own RAM, but it can only be indirectly accessed via the registers. This means you can redefine the character set which is held in the VDC RAM, or store directly to screen. However, this cannot be done in BASIC, so we must resort to machine code. The registers we need are 18, 19, 20, and 21. They must be written to in this order:

Store the high byte of the address in register 18.

Store the low byte of the address in register 19.

Store the byte to be poked at address in register 20.

Store the number of characters in register 21.

However, the VDC stores the number of characters plus one. So in register 21 we have to store the number of characters minus one. Also, you may have noticed that you can't print one character. Oh well you can, all you need to do is not write the number of characters to register 20. The whole process is carried out with bit screen of register 24 cleared.

You can also copy RAM from place to place, using the same method but thankfully it works properly! The number of characters to be copied corresponds to the word count register (25). The method is basically the same as storing characters but you must set the copy bit in bit 7, register 24. The start address to be copied is stored in registers 18 and 19, and the destination address is stored in registers 32 and 33. The copying process begins when the word count register is written to.

The VDC Screen

The screen is extremely versatile - you can change the physical size of the

Figure 4

Reading and writing RAM. Writing one character:

.write	PHA	/tempory store
	TXA	/store
	LDX #18	/low
	JSR write	/byte
	DEX	/store
	TYA	/high
	JSR write	/byte
	LDX #31	/read
	PLA	/and store
	JSR write	/data
	LDA #18	/store dummy
	JMP write	/and leave if stand alone
.write	STX \$D600	/omit (JMP write)
.read	BIT \$D600	
	BPL next	
	STA \$D600	
	RTS	

Writing more than one character: Accumulator holds the character to be stored, location 250 holds number of characters minus 1, X and Y hold the low and high address of the location in VDC memory.

.write	PHA	
	TXA	
	LDX #19	/write low byte
	JSR write	
	DEX	
	TYA	/write high byte
	JSR write	
	LDX #31	/write character
	PLA	/to be stored
	JSR write	
	LDA 250	/write number of
	DEX	/characters-1
.write	STX \$D600	
.read	BIT \$D600	
	BPL next	
	STA \$D600	
	RTS	

Reading a byte from RAM.

.read	TXA	/store
	LDX #18	/low
	JSR write	/byte
	DEX	/store
	TYA	/high
	JSR write	/byte
	LDX #31	/read
	JSR read	/and store
	RTS	/return, Acc. = value
.write	STX \$D600	
.read	BIT \$D600	
	BPL next	
	STA \$D601	
	RTS	
.read	STX \$D600	
.read	BIT \$D600	
	BPL next	
	LDA \$D601	
	RTS	

Continued on page 27

Questionnaire 1

Whether you wish to test your neighbours IQ or find out how clever friends at your computer club are, this program will help you.

By David Warner

Questionnaire 1 enables you to compile your own multiple-choice quizzes and save them out to disk for use at a later date. You can use the program just for fun or even use it for educational purposes.

The program is presented here as two basic programs. Type them both in separately and save them out to disk. When you want to use the program simply LOAD and RUN the program "Q-ROUTT". The second part of the program will then load and execute automatically.

What's the question?

Obviously before you use the program for the first time you will need to set up some questions.

When you select the 'create questions' option from the main menu you will be asked for the number of questions that you want to set. You will then be asked for each question in turn together with a number of possible answers. Once all of the information for each question is answered, you will be asked to indicate which is the correct answer.

If you find that your question is over one line in length, you must start the next line eleven spaces from the start of the second line. This is to ensure that the text will be correctly formatted when displayed on the screen.

For listings see page 73.

Save your work

When saving your questions out to disk, you may find it useful to include the number of questions within the filename. The reason for this is that you will need to tell the computer how many questions are to be loaded when you want to format any quizzes that you have set. As an example "HISTORY 20" would be a set of 20 history questions.

Time out

Provision is made within the program

to display a clock on the screen. To use this feature you should enter the time in the format P.12.05.00 the P being PM (A for AM) and the following numbers being the hours, minutes and seconds respectively.

Software for Sale

Should you purchase this month's software for sale disk you will find that there are three sets of example questions for this program on it.

73

QUESTION NO. 1

WHAT IS THE SMALLEST BIRD IN BRITAIN?

- A. BLUE TIT
- B. COAL TIT
- C. GOLDCREST
- D. WREN

ENTER A,B,C,D,? #

May I Interrupt?

How to make your C64 reveal its split personality.

By Norman Doyle

Interrupts can make your computer do things that it was never designed to do. For example, it is impossible to have capital letters, Commodore graphics and lower case letters on the screen at the same time. The usual form is capitals and graphics with no lower case; or capitals, lower case and limited graphics.

To have everything on the screen at the same time, we have to change the scan cycle in mid-scan. This is known as a raster interrupt because it takes place during the time that the screen, or raster, is being scanned.

First of all, we have to tell the computer when we want the interrupt to occur on the screen. The scan time is divided into 256 parts but although a full scan takes 256 raster count units, the screen is only visible when the value lies between 31 and 251. By storing a value in \$D012, you can cause an interrupt to occur at any moment during the scan period. If this occurs while the visible portion of the screen is being scanned, it is called a split-screen interrupt.

First of all, we have to set up the interrupt conditions. Listing 1 may seem familiar because it's based on the routine that I showed you last month. The new part of the initialize routine sets the raster interrupt.

The accumulator is loaded with the value which represents the point at which I want to interrupt the screen. It is stored in location \$D012—the raster compare byte. Next, the computer has to be told to expect a raster interrupt. This is done by setting the first bit in location \$D01A.

You'll notice that there are two interrupt routines and that one modifies the interrupt vector (double byte \$D014) to point to the other routine. So you establish two interrupt environments which are executed on alternate interrupt periods.

The basic routine causes the colors of the screen and border to change in mid-scan and the effect on the screen makes the top of the screen yellow and the bottom area black.

Apert begins changing the interrupt vector, each routine has to reset the

Table 1

Command Type	Examples	No. of cycles
Implied	CLC CLD CLI CLF DEX DCF INX INC NOP SEC SED SSI TAX TAY TSL TBA TSB TZA	2
	PHA PHP	3
	PLA PLP	4
	RTI RTS	6
Absolute	JSR	6
Relative	BCC BCS BOD BND BNE BPL BVC BVS	2*

*Add an extra clock cycle when the program takes the branch and add another if the branch then crosses a page boundary.

value of the interrupt compare byte to that of the other interrupt value. Then the computer is told to execute the next screen interrupt by setting the lowest bit of location \$2815.

In case you're wondering why two interrupt routines are necessary, consider what would happen with only one. When the first interrupt causes the screen colour change and will not automatically change back to the original colour. The net effect, therefore, would be to maintain yellow as the screen colour so much that the run time program was trying to destroy. The second interrupt changes the colour so that the colour banding occurs.

The RASTER1 and RASTER2 values are arbitrary ones which I have selected for this demo. The first value must be less than 51 otherwise a black band would appear at the top of the screen - a good way to cause a coloured band across the middle of the

screen. RASTER2 determines where the colour change occurs, therefore any value between 64 and 278 could...

The second routine starts off with several NOP commands. Although these apparently do nothing, the effect is to delay the execution of the colour change so that it occurs at the end of a line. Without this delay, the interrupt would occur in the middle of the line causing glitches which may show up as flickering or create a 'step' on the smooth line of the screen split.

Such timing problems can be tackled in one of two ways. The NOP system lengthens the interrupt code and reduces the amount of time in which other things could be done. A better way of overcoming this problem is to place the colour change code further down the routine, after calculating the number of clock cycles which are needed for the delay. A list of these cycle times can be found in Table 1 and Table 2.

program should run as if nothing has changed!

```
LDA # ROSTIME/255 ... 2 cycles
STA LOVECTOR ... 4 cycles
LDA # ROSTIME/254 ... 2 cycles
STA HVECTOR ... 4 cycles
LDA # RASTER1 ... 2 cycles
STA $D012 ... 4 cycles
Total=18 cycles
```

To get both sets of characters on the screen at the same time means waiting in a little simulation. This may seem like cheating but a little study of the ROM handling will reveal the reasons why the technical details is necessary.

The VIC chip can only access one 16K block of memory at a time. This not only applies to the screen but also to the character set. On power up the screen is situated at \$0400 but the character ROM lies at \$D000, well over 16K away. To allow the VIC to 'see' the ROM, the operating system places an 'image' of the ROM at \$D000. This image is invisible to the user but essentially very real and necessary to the operating system of the computer.

All we do with the supplementary Listing 2 is to physically transfer the ROM characters in the lower section of memory where its image normally lies.

Having done this, the two routines have to be altered to switch between the 'original' characters and the lower case ones. This is done by altering location \$D012 which acts as a character pointer. How this works does not concern us yet, it will be the subject of a later section of this series.

Next, enter Listing 3 and then run it. You will see two capitals blocks but press any key and the bottom set changes to lower case. Now we have both character sets displayed at the same time.

Move the cursor to the bottom line of the screen and continue pressing down the cursor until the first line of the bottom block lies on the screen split. Now you can see that my 'arbitrary' split value was not so arbitrary after all!

What you should see is that the top half of the letters are in capitals while the bottom half remains in lower case.

That's as far as I am going during this session but next time I'll be concerning myself with smooth scrolling and the tricks that all this goes up to in the program itself.

See listings on page 77.

Table 1

	Accumulator	Immediate	Address	Address, M	Address, M	Address Indirect	Zero Page	Zero Page, X	Zero Page, Y	Indirect, X	Indirect, Y
ADC	32	4	4*	4*	...	3	4	...	...	6	3*
AND	32	4	4*	4*	...	3	4	...	...	6	3*
ASL	32	6	7	...	...	3	6	...	...	...	...
BIT	4	4	...	...	...	3	...	...	...	...	...
CMF	4	4	4*	4*	...	3	4	...	...	6	3*
CPX	32	4	...	...	...	3	...	...	...	...	...
CPY	32	4	...	...	...	3	...	...	...	...	...
DEC	6	7	...	...	...	3	6	...	...	...	...
EOR	32	4	4*	4*	...	3	4	...	...	6	3*
INC	6	7	...	...	...	3	6	...	...	...	...
JMP	3	...	...	...	...	3	...	...	...	...	...
LDA	32	4	4*	4*	...	3	4	...	...	6	3*
LDX	32	4	4*	4*	...	3	...	4	...	...	...
LDY	32	4	4*	...	...	3	4	...	...	...	...
LSR	32	6	7	...	...	3	6	...	...	...	...
ORA	32	4	4*	4*	...	3	4	...	...	6	3*
ROL	32	6	7	...	...	3	6	...	...	...	...
ROR	32	6	7	...	...	3	6	...	...	...	...
SBC	32	4	4*	4*	...	3	4	...	...	6	3*
STA	4	3	3	...	...	3	4	...	...	6	6
STX	4	...	...	...	...	3	...	4	...	...	...
STY	4	...	...	...	...	3	4	...	...	...	...

*Add one clock cycle if ending occurs a page boundary.

The timing is not too crucial because setting up a new scan line takes approximately 28 cycles. From our example, we can calculate that

nine NOP actions represent 18 cycles. This means we have to add between 18 and 46 cycles. If the following lines are moved to replace the NOPs, the

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- Fuller, C. E. 1992. *How to Grow a Good Plant*. New York: Random House.

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BobstTerm Pro

A close look at what could be the ultimate C64 communications program.

By David Janda

BobstTerm Pro (BTP) was produced in the United States by Bob Lentini, a leading authority on Commodore communications. The package is being distributed in the UK by Precision Software who are best known for their Superbase and Superscript packages.

To enter BTP as communications software would be a bit of an insult. BTP is a complete telecommunications environment that incorporates almost every facility you could hope for. I say 'almost' because the package was written for the American market, and as such there are a few facilities that we would not use here in the UK - the Point-to-Point transfer protocol being one example. Having said that, the few inconsistencies that I noticed do not affect the overall performance of the package.

User Friendly

BTP is a complex package, yet easy to

use. This is because the author has opted to make BTP completely menu driven. Not the best user interface when compared to something like Amigas Kickstart, but it's very fast and effective in use. All the menus are well laid out and it was immediately apparent that a lot of thought went into the design of the menus. Presenting a screen full of detailed information such as the XMODEM transfer characteristics in a clear, easy to read format is not an easy task, but BTP succeeds in this respect.

The menus are in a hierarchical form with the main menu at the 'top' with sub-menus leading from it. Most of the commands are of the single key type with the letter corresponding to the action, e.g. pressing the Commodore key with E will toggle the echo. There are 19 such commands which are called control commands, and pressing 'K' from the main menu will list them with their associated functions.

Features

There are three methods of entering terminal mode in BTP, by pressing 'T' from the main menu, from the auto menu after dialing a number, or from the auto menu in answer mode. Once in terminal mode you are presented with a blank screen with five status lines at the top; the first of which is used to display various control settings (e.g.:

```
CR LF XXXXX E L HD C P ASC X
XXXXXXXXXXXXXXXXXXXX
```

BF will show how many characters there is in the buffer (which sits up off at 32,500 bytes). E indicates whether echo is enabled and so on. Options that are enabled have their corresponding letters displayed in reverse video, and all the control commands are accessed by pressing the Commodore key followed by a letter (Table 1).

The next line consists of 40 dashes or a double row of dashes depending on whether the modem is on or off hook, and the following two lines are used to display various messages when something fails. If anything drastic happens, such as an aborted file transfer, a flashing message will be displayed on the next line.

Communications is carried out on the following twenty lines by forty characters with the option of entering text in a two-line window. This is very handy for those who like to play online adventure games or use real time chat facilities because the entered text will not be broken up by any incoming text.

One handy command of particular interest is the word wrap feature. When enabled, text entered by the user will be formatted. Likewise, text being sent from the host system will also be formatted and this feature proved to be most useful when using BBS that are set up for 80 columns output.

The terminal mode and the rest of BTP has a couple of cosmetic features. If you don't like the character set that is used then you can select another from a choice of seven more, and you have the ability to define your own. The colours and for text, error messages, menus and so forth can all be individually changed as well.

Buffering

Most packages have some sort of buffering facility which can be used to grab text that is being sent from the host system. With BTP the concept of buffering is taken much further. You have the option to SAVE/LOAD to/from disk or RAM, alter the buffer with a complete array of editing commands that would put some word processing packages to shame, and much more. BTP does not limit the buffer to ASCII use only. Basic programs can be automatically converted to ASCII when loaded into memory and sequential listings can be converted into Basic programs. A host of other conversion formats are available, and BTP enables you to define your own!

A detailed optical bound user guide that's over 100 pages in length describes very clearly every aspect of the package. A section is devoted to each feature and the six page contents enables easy reference. The guide is

TABLE 1 — COMKEY COMMANDS

A — ASCII/BINARY
B — BUFFER
C — CAPS LOCK
D — DISPLAY TRANSFER
E — ECHO
F — SCREEN FORMATTING
H — HOOK TOGGLE
I — LINEFEED ON
O — LINEFEED OUT
K — FUNCTION KEY LIST AND EDIT
L — LINE/CHAR ENTRY MODE (TERM MODE)
N — NULL STRIP (TERM MODE)
P — PRINTER ONLINE (TERM MODE)
R — RESET TIMER
S — SET TIME/START-STOP TIMER
T — TIME/TIMER TOGGLE
X — XFER FILES (TERM MODE)
@ — DISPLAY CTRL CHARS
* — CLEAR SCREEN (TERM MODE)

roughly divided into three sections: the first part covers getting started (for the impatient), next follows a detailed description of the package and the remainder of the guide covers parameter setting.

Compatibility

Before I detail BTP's features it's worth noting what the package cannot do, and the features that probably will not be of use to UK users.

First, BTP only works with modems that are connected to the user port, or modems that are interfaced with an RS232 converter which in turn is connected to the user port. This rules out the UK Commodore modem (commonly referred to as the Computer modem). BTP contains a number of 'drivers' and is configured to work with the following modems:

Commodore 1650 Autodemod;
Commodore 1680 Modem/200;
Commodore 1670 Modem/1200;
Winbridge Modem;
Master Modem;
Mity-Mo Modem;

Hio 1 and H Modem;
Total Telecom Modem;
Hayes Smartmodem.

Most of the modems listed are not available here in the UK. This is not a problem though as BTP will work with any manual modem that's connected to an RS232 interface. However, unless you have one of the intelligent modems listed, or a Hayes-compatible modem such as the Pace Series Four you will not be able to make use of the automatic features of the package. Demos/Younger owners will not be able to autodial with BTP as these modems auto-dial by toggling the RTS line which is rather unconventional. Having said this it should be possible to make use of the auto-answer feature of these modems as long as pin eight on the RS232 connector is connected.

BTP allows pulse or tone dialling. The tone dialling feature is created by feeding the audio output of the C164 pack into the modem, but this feature is redundant because the UK System X dial tones are different from those used in the States — enough said.

Two other points worth noting are the Pause file transfer protocol and repeat dialling. BTP provides a number of file transfer protocols from straight ASCII to X2410DCM (which is widely used throughout the UK). The Pause protocol is quite common in the US but not so here. However, I understand that a number of European Commodore Bulletin Boards will soon be using Pause, and if you should dial direct to the States it will be doubt be of use!

On a more serious note, BTP allows for repeat dialling. That is, when a number is auto-dialed and the host is at the other end of the line does not answer BTP will continuously try the number over and over again. Your Commodore would like to point out that it is currently illegal for modems to repeat dial more than four times in succession, and as there is no facility to limit the number of re-dials it had going this feature should be used with caution.

The Clever Stuff

The auto mode in BTP is used with one of the intelligent modems that is supported by BTP or a Hayes

compatible modem. From the auto mode menu you can enter a phone number and BTP will send the necessary command string to the modem to get it to dial the number. In answer mode the package will wait for an incoming call, answer the phone and display a welcome message which can be defined by the user. A new feature is the ability to set up a password, thus offering a degree of security.

No doubt there are many similar sets of commands that you use when logging onto a BB or database. BTP allows the user to define a series of operations, called macros, that can be executed manually or automatically. Basically, a macro can consist of any BTP command, be it menu level, a control command or text that you would enter in terminal mode. The macro facility also has a degree of program control, so it's possible to detect whether certain characters have been sent by the host, and if so perform another set of commands.

The macro commands can be executed manually or automatically by setting a time when they should be executed. I had great fun defining a macro to dial Telecom Gold, enter my ID and password, check if there was any mail, speed it to disk if so and log off, or log off if there was none—all done when I was down the pub!

It's not as easy as it sounds though, and I wish BTP had more sophisticated macro commands. As it is, the present commands are rather limited.

As I have mentioned before, BTP is a sophisticated telecommunications package, yet it's easy to use. Even though the package is loaded with features, using it is simplicity itself, and if you use the phone book option which dials a set number each time it is executed things are even easier. For example, from the main menu, connecting to a BB or database can be as little as three key presses away; this ease of use is by far BTP's strongest point. The menu system and excellent

manual enabled me to use the package straight away with no problems whatsoever which is ideal in a console environment. No console package can offer a set of pre-defined settings that will see you through all possibilities. BTP offers some, but it also allows the user to tailor just about every aspect to their own requirements and save them as default settings.

In simple terms, RobTerm Pro is the best piece of terminal software I have used on the Commodore 64. Its powerful features match and surpass those found on many professional PC based console packages, and at £24.95 it represents excellent value for money.

Footnote:

Name: RobTerm Pro. Supplier: Precision Software Limited, 5 Park Terrace, Worcester Park, Surrey KT7 1Y. Tel: 01-335 7196. Machine: C64/128. Price: £24.95.

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Sprite Library

Continuing our Sprite Library series, this month we look at the ways of producing different types of vehicles.

By Mike Benn

This month's addition to the Sprite Library will be helpful in the area of scrolling backdrops. The vehicles listed in the table require multi-colour mode and each definition needs two sprites per vehicle. Each vehicle is made up of four blocks of sprite data - the first pair being a side view and the second pair depicting a birds eye view. All the traffic faces right so if you need any of the vehicles facing left they will need to be manipulated by a suitable sprite editor.

Table (Vehicles - Multi-colour)

Hex	Decimal	Description
A0-A3	160-163	Bicycle
A4-A7	164-167	Tandem
A8-AB	168-171	Scooter
AC-AF	172-175	Motorcycle
B0-B3	176-179	35 CWT Van
B4-B7	180-183	Light van
B8-BB	184-187	Land Rover
BC-BF	188-191	Light pickup
C0-C3	192-195	Jeep
C4-C7	196-199	Generic car
C8-CB	200-203	Small hatch-back
CC-CF	204-207	Saloon car
CD-D3	208-211	Sports car
DA-DB	212-215	Porsche
DE-DF	216-219	Racing car
E0-EF	220-223	Taxi cab

Getting it all in

Type in the basic loader as published and *save it* before you run it or it will self-destruct. Before running the loader program you will need to reset the computer and type the following:



POKE \$A0:0 POK \$A4:04 POK \$B3:04,
CNEW and press return. This will trick the computer into believing that the Basic now starts at \$4000 instead of \$B001. Now in the Basic loader and run it; if error free, the program will automatically save itself as a block of data. If you reload that data in the future remember to add a 1 after the device number. The data is saved in the following location: \$2000-\$277F.

The sprites run from 160 to 223 (in a compressed mode) to avoid the area of \$2000 traditionally set aside for redefined character graphics and to avoid the need of typing in lines after lines of data.

If only one or two sprites are required then use this formula: $C \text{ Sprite block No.} - 160 \div 4 + 160$ the data line number at which the sprite block data starts. Remember to type in the following three lines of data and alter the variable BL to the number of data lines you have in your finished program, line 1.

The small basic program Vehicle Display will print the sprites variously expanded to fit on the screen in both side and top views simultaneously. To hold on any sprite enter the same number for Start and End.

Any Sprite Editor program will enable you to change and adapt the individual sprites to your own requirements.

See listings on page 77.

Bothersome Basic

The old truism garbage in, garbage out is still relevant today, especially when using the INPUT command.

By Norman Doyle

One of the most common reasons why a program crashes is through unexpected responses when the user has to input some data through the keyboard. Trapping these unexpected entries not only calls for an alert programming mind but also for a rethinking of the whole situation.

The problem with the Basic INPUT command is that it runs according to its own rules. This is fine if the users understand what these conditions are but not very forgiving if they don't. If the input is stored as a string variable the problems are easily rectified but using a numerical variable causes real problems.

Using inputs which take up less than two screen lines will rarely cause problems as long as the string does not include a carriage or a colon. Either of these symbols act as a terminator and only that part of the entry before the first occurrence of one of these symbols will be accepted as input, the rest is ignored. The computer responds to an incomplete acceptance of the attempted input with a rather unfriendly EXTRA IGNORED message.

A simple program such as:

```
10 INPUT "ENTER MESSAGE" A$
20 PA$
```

would respond to an input such as

```
1MASTER OLIVER TWIST, WANT
MORE
in the following way:
EXTRA IGNORED
1
```

If the user made a mistake and went beyond the delete key so as to totally erase the ENTER MESSAGE prompt, further chaos would result with the following response:

```
EXTRA IGNORED
R TWIST
```

The part typed over where the original prompt was up in the cursor's old starting position has been ignored, as well as the extra piece after the comma.

The number of characters typed as an input can also cause problems. If the input continues beyond two screen lines and onto a third, only the characters on the third line will be accepted and no error message will appear.

The only way around this is to get confirmation of each entry with a check routine such as:

```
10 INPUT "ENTER MESSAGE" A$
20 "PLEASE CONFIRM THAT
YOUR MESSAGE WAS:"
30 PA$
```

```
30 "PRESS Y OR N"
40 GET B$ IF B$="Y" GOTO 90
50 GET B$="N" GOTO 10
60 GOTO 40
90 REM END OF PROGRAM
```

Of course this only confirms or denies that the entry was correct. A total novice might keep trying to type in the same message until boredom and frustration sets in. The only foolproof way out is to give specific details of what can and can't be done when an error is confirmed. Quite a painful and dull way to write an interactive program.

As if this weren't bad enough, numerical variables can be worst. At least the incorrect string inputs don't result in the termination of the program. With an interactive maths program it's always tempting to enter very large numbers. Try entering a six number into this program:

```
10 INPUT "ENTER A NUMBER" A
20 PA
```

As the number increases it is eventually treated as an exponential value such as 1.2345E+06. If the exceeds the maximum number that the computer can deal with (1.70140884E+38), as OVERFLOW IN LINE 10 error will be generated and the program will crash out and return to

the READY prompt and direct keyboard control. Not very impressive in a complex accounts program.

This can only be avoided if the number is entered as a string such as AS and then evaluated and stored as a numerical variable, A, after complex processing. There must be a better way!

The best way, though long winded, is to use the GET command and build a string character. In this way you decide which characters may be entered.

First of all a suitable prompt message and a GET loop must be set up:

```
10 "ENTER MESSAGE:"
20 GET AS$IF AS$="" THEN 30
```

Now we need to print the character on the screen as such it typed in and to store them as a separate string, BS:

```
30 BS=""
100 BS=BS+AS:GOTO 20
```

The difficult part is deciding which characters will be accepted and which will be rejected. First we'll assume that the message is going to be a mixture of numbers and letters (alphabetic characters).

Every letter and number has a value assigned to it under a system known as ASCII (the American Standard Code for Information Interchange). CHRS has its own version of this which is officially called Commodore ASCII (pronounced asky) but has commonly become known as PETASCII after Commodore's old range of computers which first used this system.

Under this system the numbers zero to nine have values from 48 to 57 and 'A' to 'Z' have values ranging from 65 to 90. The numbers 58 to 64 cover such things as the question mark, colon and comma, so to make things simple, we may as well include those in acceptable range. That we get a range of 48 to 90.

This range does not include some other useful punctuation marks such as the comma, full stop or exclamation mark, but does include the value of 32 which represents a space. Fortunately these can all be incorporated by stretching the lower limit down to 32.

At this point we can use the greater than and less than facilities as follows:

```
80 IF AS=CHRS(32) AND AS<>"Z" THEN 20
```

This means that each character is checked to see if its ASCII value lies between 32 and 90, if not it is rejected and the program loops back to get another keypress.

With the program as it stands BS can be stretched to hold 255 characters and no more. We need a delimiter which will stop any user from trying to type in more than that number:

```
90 IF LEN(BS)=255 THEN
100 "MESSAGE TOO LONG.
PLEASE TRY AGAIN" GOTO 5
```

There are kinder ways to do this but that will be covered in a later article.

The routine so far will work as long as the user types in the message correctly. What if a mistake is made?

First we must check for a DEL keypress. To jump to the routine for deleting the last letter from BS and from the screen. Even the DEL key has a value assigned to it and this is 26.

If you enter CHRS(26), a 'Z' will be printed on the screen, similarly CHRS(30) will cause a deletion of a character. So we can easily complete one of the demands of constructing a routine by using the CHRS command:

```
30 IF AS<>CHRS(26) THEN 50
50 CHRS(30)
```

Obviously this deals with the screen but what about BS? It has to be dealt with using the string manipulation commands. What we need is to keep the left-hand side of BS and discard the last letter. Putting it another way we reduce the length, LEN(BS), by one, LEN(BS)=LEN(BS)-1 is an illegal command but

```
60 BS=LEFT$(BS,LEN(BS)-1):GOTO 20
```

will do the trick until LEN(BS)=0. A string cannot have a negative length and an error message would be generated if nothing were done. To trap this problem the following line will act as a filter:

```
40 IF LEN(BS)=0 THEN 20
```

The final stage of the line input routine is to check for a carriage return, ASCII 13, and exit to the rest of the program:

```
70 IF AS=CHRS(13) GOTO 130
110 PRINTLEN(BS)
```

Although this is better than the normal INPUT command, it's not perfectly foolproof and it does take up a lot more space than the normal input procedures. This can be compensated for by parameter swapping. As you can see from the slightly modified Listing 1, the routine is set up in a subroutine. If the main program avoids using the parameters mentioned (AS,BS) you can GOSUB to this routine. On RETURNING BS can be simply returned with a command such as RETURNAS=BS and the routine can then be called again for the next input later on.

For numbers the acceptable range needs only to be ASCII 48 to 57 with special allowances if decimal points, currency symbols or arithmetical operators are expected.

Evaluation of BS would be a necessary in a numerical variable after first shortening the string to a manageable length for the computer to deal with. This is rather like deciding how many significant figures, and hence the degree of accuracy, of a calculation. In this way numbers in excess of 1.90141894E+38 can be rejected before the program tries to use them and subsequently crashes out.

The Deep End

For the more accomplished, the INPUT command can be forced to accept colons and commas by skilled users. Before using the INPUT command, quotation marks are placed in the keyboard buffer as though they had been typed there.

To do this ASCII 34 is poked into the first buffer byte at 161 and the buffer queue at 198 is informed that there's one character already waiting there. When the INPUT command is executed, the quotation mark is printed alongside the input question mark.

```
10 POKE 161,34:POKE198,1
20 INPUT "ENTER MESSAGE"AS$
30 GOS
```

I repeat that I cannot answer your problems by phone but if you have any queries about Basic, country or about these articles, please send them to: Redstone Base, Team Commodore, 1 Gullion Square, LONDON W8R 3AR (including an SAE and any relevant printout or recordings). EE

[illegible]

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[illegible]

As a result, it is important for computer users to be aware of the proper use of the printer. Using more than one printer can be a good idea, but it is important to be aware of the printer's capabilities. The printer should be able to handle the type of data being printed, and it should be able to handle the volume of data being printed. The printer should also be able to handle the type of paper being used, and it should be able to handle the type of font being used. The printer should also be able to handle the type of color being used, and it should be able to handle the type of resolution being used. The printer should also be able to handle the type of output being used, and it should be able to handle the type of output being used.



Change in Δ = Mean	0.0000
Standard Error = Std. Error	0.0000
Lower Bound = Lower	0.0000
Upper Bound = Upper	0.0000

1. General Information	2. Financial Information
3. Operational Information	4. Environmental Information
5. Human Resources Information	6. Other Information

THE 2008 CONGRESS HAS PASSED SEVERAL BILLS THAT WOULD SIGNIFICANTLY IMPROVE THE QUALITY OF INFORMATION AVAILABLE TO THE PUBLIC, BUT THE SENATE HAS NOT PASSED ANY OF THEM. THE 111TH CONGRESS MUST PASS THESE BILLS TO IMPROVE THE QUALITY OF INFORMATION AVAILABLE TO THE PUBLIC.

WARNING: Do not use this equipment unless you have received the proper training. Improper use may result in injury or death.

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E-mail: ajm22@cam.ac.uk

ALL DISKS CARRY A NO CLERK REPLACEMENT
GUARANTEE ARE CERTIFIED 100% ERROR FREE & COME
WITH LABELS & 1/4" ALSO HAVE SLEEVES & WRAP
PROTECTS. FIVE DRUM DISKS HAVE 2 HOLES AND
CLOSURES.

SP-RECORD, CONT'D									
NO	DATE	TIME	WIND	WAVE	WAVE	WAVE	WAVE	WAVE	WAVE
00 12	00714	1.00	0000	0	000	000	000	000	000
00 13	00714	1.00	0000	0	000	000	000	000	000
00 14	00714	1.00	0000	0	000	000	000	000	000
00 15	00714	1.00	0000	0	000	000	000	000	000
00 16	00714	1.00	0000	0	000	000	000	000	000
00 17	00714	1.00	0000	0	000	000	000	000	000
00 18	00714	1.00	0000	0	000	000	000	000	000
00 19	00714	1.00	0000	0	000	000	000	000	000
00 20	00714	1.00	0000	0	000	000	000	000	000

Age	Sex	Height (cm)	Weight (kg)	Body Mass Index (kg/m ²)	Waist Circumference (cm)	Waist-Hip Ratio	Waist-to-Hip Ratio (cm)
24	M	175	75	24.2	95	0.95	95
25	M	176	76	24.4	96	0.96	96
26	M	177	77	24.6	97	0.97	97
27	M	178	78	24.8	98	0.98	98
28	M	179	79	25.0	99	0.99	99
29	M	180	80	25.2	100	1.00	100
30	M	181	81	25.4	101	1.01	101
31	M	182	82	25.6	102	1.02	102
32	M	183	83	25.8	103	1.03	103
33	M	184	84	26.0	104	1.04	104
34	M	185	85	26.2	105	1.05	105
35	M	186	86	26.4	106	1.06	106
36	M	187	87	26.6	107	1.07	107
37	M	188	88	26.8	108	1.08	108
38	M	189	89	27.0	109	1.09	109
39	M	190	90	27.2	110	1.10	110
40	M	191	91	27.4	111	1.11	111
41	M	192	92	27.6	112	1.12	112
42	M	193	93	27.8	113	1.13	113
43	M	194	94	28.0	114	1.14	114
44	M	195	95	28.2	115	1.15	115
45	M	196	96	28.4	116	1.16	116
46	M	197	97	28.6	117	1.17	117
47	M	198	98	28.8	118	1.18	118
48	M	199	99	29.0	119	1.19	119
49	M	200	100	29.2	120	1.20	120
50	M	201	101	29.4	121	1.21	121
51	M	202	102	29.6	122	1.22	122
52	M	203	103	29.8	123	1.23	123
53	M	204	104	30.0	124	1.24	124
54	M	205	105	30.2	125	1.25	125
55	M	206	106	30.4	126	1.26	126
56	M	207	107	30.6	127	1.27	127
57	M	208	108	30.8	128	1.28	128
58	M	209	109	31.0	129	1.29	129
59	M	210	110	31.2	130	1.30	130
60	M	211	111	31.4	131	1.31	131
61	M	212	112	31.6	132	1.32	132
62	M	213	113	31.8	133	1.33	133
63	M	214	114	32.0	134	1.34	134
64	M	215	115	32.2	135	1.35	135
65	M	216	116	32.4	136	1.36	136
66	M	217	117	32.6	137	1.37	137
67	M	218	118	32.8	138	1.38	138
68	M	219	119	33.0	139	1.39	139
69	M	220	120	33.2	140	1.40	140
70	M	221	121	33.4	141	1.41	141
71	M	222	122	33.6	142	1.42	142
72	M	223	123	33.8	143	1.43	143
73	M	224	124	34.0	144	1.44	144
74	M	225	125	34.2	145	1.45	145
75	M	226	126	34.4	146	1.46	146
76	M						

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100																																																																																																																																											
1990-1999	11.00	20.00	27.00	33.00	38.00	42.00	45.00	47.00	48.00	49.00	50.00	51.00	52.00	53.00	54.00	55.00	56.00	57.00	58.00	59.00	60.00	61.00	62.00	63.00	64.00	65.00	66.00	67.00	68.00	69.00	70.00	71.00	72.00	73.00	74.00	75.00	76.00	77.00	78.00	79.00	80.00	81.00	82.00	83.00	84.00	85.00	86.00	87.00	88.00	89.00	90.00	91.00	92.00	93.00	94.00	95.00	96.00	97.00	98.00	99.00	100.00	101.00	102.00	103.00	104.00	105.00	106.00	107.00	108.00	109.00	110.00	111.00	112.00	113.00	114.00	115.00	116.00	117.00	118.00	119.00	120.00	121.00	122.00	123.00	124.00	125.00	126.00	127.00	128.00	129.00	130.00	131.00	132.00	133.00	134.00	135.00	136.00	137.00	138.00	139.00	140.00	141.00	142.00	143.00	144.00	145.00	146.00	147.00	148.00	149.00	150.00	151.00	152.00	153.00	154.00	155.00	156.00	157.00	158.00	159.00	160.00	161.00	162.00	163.00	164.00	165.00	166.00	167.00	168.00	169.00	170.00	171.00	172.00	173.00	174.00	175.00	176.00	177.00	178.00	179.00	180.00	181.00	182.00	183.00	184.00	185.00	186.00	187.00	188.00	189.00	190.00	191.00	192.00	193.00	194.00	195.00	196.00	197.00	198.00	199.00	200.00	201.00	202.00	203.00	204.00	205.00	206.00	207.00	208.00	209.00	210.00	211.00	212.00	213.00	214.00	215.00	216.00	217.00	218.00	219.00	220.00	221.00	222.00	223.00	224.00	225.00	226.00	227.00	228.00	229.00	230.00	231.00	232.00	233.00	234.00	235.00	236.00	237.00	238.00	239.00	240.00	241.00	242.00	243.00	244.00	245.00	246.00	247.00	248.00	249.00	250.00	251.00	252.00	253.00	254.00	255.00	256.00	257.00	258.00	259.00	260.00	261.00	262.00	263.00	264.00	265.00	266.00	267.00	268.00	269.00	270.00	271.00	272.00	273.00	274.00	275.00	276.00	277.00	278.00	279.00	280.00	281.00	282.00	283.00	284.00	285.00	286.00	287.00	288.00	289.00

ATLANTA 11	MECHANITE	1000
ATLANTA 12	MECHANITE	1000

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Ackroyd's Saga

Let your computer take the strain of learning tables.

By Allen & Margaret Webb

In case any regular readers of my Teacher's Pet column haven't worked it out for themselves, I've got a pretty shocking confession to make. I am very old fashioned, both in the way I bring up my children and in their education. I believe in old fashioned values of politeness, honesty and respect for one's elders and those old hat school subjects of spelling and learning tables. Both of these have been out of favour; the former because it was believed that it stifled creativity, the latter in some cases simply because the diversity of the curriculum pushed these subjects to the bottom of the pile. Luckily the primary school that both of my children attended believed that learning tables was important and table tests were a regular occurrence.

A look around the shops will confirm the need for mental arithmetic and multiplication tables. How many

times have you watched as simple calculations have been worked out on scraps of paper or the ubiquitous calculator when they could have been computed just as quickly in the brain?

Improving Numeric Skills

Ackroyd's Saga is the first of two games aimed at helping the learning process of mental arithmetic skills. In the game, the 0 to 12 times tables are tested. The thought times table is included since it is a difficult concept to grasp. In the game, you play the role of a trainee knight searching for the parts of the key which will let you into Ackroyd's castle. (Ackroyd is the usual evil king.) On your way to the castle you will encounter various monsters. You must fight these if you

want to get passed them, and 'fighting' involves answering tables questions. You answer an odd number of questions. If you get more correct than wrong, you win.

There are five levels in the game with each level posing questions on different tables. The easiest level deals with 0 to 2 times tables, the most difficult deals with 0 to 12. In addition, the levels give you different times to respond. The default values give ten seconds at the easiest level and six seconds at the top level. You can change the times and number of runs if you wish by choosing the edit option in the game loader.

The game is controlled by a joystick (or pen 2) or keyboard (8: moves south, 2: east, N: North, W: West). To answer questions you simply type in the answer and press Return. Delete will clear any mistakes.



LOADER	SAVE name	Start Address	Finish address
1	SPRITES	12288	14784
2	CHARSET	18240	11287
3	HOUER-GLASS	8182	8920
4	OBJECT.1	8144	7373

The game comprises six modules. To convert the loaders to usable code, use the following procedure:

Type in **POKE 64,64** **POKE 64728,6-NEW**
LOAD and **RUN** the loader
LOAD and **RUN** the Code Server routine using the details given in the table. You don't have to use the suggested names but if you don't, you must amend the BASIC portion accordingly.

Once you have completed this procedure for each loader, you can test them by **LOADING** them all then forget the secondary address... **LOAD "name" 8,1** or **LOAD "name", 1,1**. And type in the line:
SYS 60448/5788123

You should get the display and be set a question to answer. If this happens, all is well.

The BASIC program controls the whole program. You should note that the first portion assumes that you are loading from disk. Cases to users must change the device number.

The game play is quite simple. The knight walks in the direction you specify. If you use keyboard control, auto repeat allows you to hold the keys down. When you reach the edge of the window, the next part of the map is

on. If you enter a square with a part of the key, it is automatically yours. Find all four keys and reach the castle door and the game ends.

Now we will compile the loaders and show you how to run the game. The last two loaders are converted to code as before but with a slight difference:

Type in **POKE 36,128** **CLR**
LOAD and **RUN** the loader
LOAD and **RUN** the Code Server routine using the details given in the table.

To play the game, reset the computer by turning it off and on or by using **SYS 64738**. You then just **LOAD** and **RUN** the BASIC portion.

Next time we will give a map of the

LOADER	SAVE name	Start Address	Finish address
5	OBJECT.2	32768	36176
6	MAP	36864	40343

displayed. If you enter a square with a enemy, you must fight. If you win, the enemy vanishes. If you loose, you are dumped on the last square you were

game and an editor which will allow you to change the locations of the key parts and the map.

See things on page 77.

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The 64 KERNAL supports 6502 via the user port. This interface provides the necessary voltage conversion for direct connection to 6502 printers, modems and other devices. It is compatible with Kaypro and Supersnap. The unit is supplied with 1 metre of cable (gold finger edge) (terminated in a 20-way male pin female) Connector. The software includes a terminal emulator which supports split baud reserved auto-dial, file transfer utilities, a menu driven port initialization program, and a transparent printer driver which controls the KERNAL, to redirect device 4 printer output to the 6502 port.

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Games Reviews

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consult our review pages.*

Quaden



Inspired by Grindor's *Blonder*, *Quaden* is an arcade game in which you must bank before you leap if you're going to get to the top of the high score table.

Quaden consists of two tracks of planes that can be attempted in any order but only the very bravest stupid dive straight into plane two.

In plane one you simply have to complete a series of exercises that will prepare you for what's to come. In the other planes you must reach the GOAL before the time runs out. To get to the goal you will have to negotiate a maze, travel long lifts and through teleporters, avoid ground that drains your time and areas that just disappear leaving you on the way to oblivion. You will have to get around locked doors that are opened only by finding specific keys. To add to your problems some keys remain invisible until you're next to them, and are usually next to a killer Skull and Cross bones, where one wrong move will cost you that game.

However, you can get some help from objects you can pick up such as amulets that reveal the GOAL, and objects that give you extra speed at short time and sound surprise buttons that may help or hinder you.

At the end of each plane you have a chance to pick up some extra points in a bonus screen, and a chance to rest before attempting the next plane. This game would be tough enough without the time limit, with it, it's almost impossible. T.H.

Publisher:

Title: *Quaden*. *Supplier:* Thomson, 2 Montreal House, Calver Park, Aldershot, Berkshire RG7 4QH. *Machine:* C64. *Price:* £29.95/£14.99 (Box). *Originality:* 7/10. *Graphics:* 7/10. *Playability:* 4.5/10. *Value:* 5/10.

Starfox



In the unofficial sequel to *Starfox* you are Hanuman and your mission is to destroy the aliens that have invaded the protective Rubicon cube that surrounds eight planets.

The standard *Starfox* is equipped with a turbo-drive that will send you hurtling through space but will also drink fuel at an alarming rate and a standard laser. However, you can improve your chances and your fuel by docking with mother-ships that orbit the right planets and choosing from the selection of weapons that include energy bolts, shockers and more powerful lasers.

You'll need this extra weaponry to wipe out the invading swarms of aliens that come at you ten at a time. If you haven't got the right weapons you may have to shoot each alien four times to destroy it.

The aliens don't actually fire at you but they do exhaust your fuel supply, which will cost you the game. You can refuel at a planet or from a revolving ship but only if you can find one in time.

Starfox is a game that will require its players to invest some time in it before they become hooked. Once they've completed a few levels (this will take some time) they will become hooked by it.

Touchdown

Title: *Starfox*. **Supplier:** Nintendo. **9 Stroud Rd, Putney, London SW15 2NU. Tel:** 01-783 4383. **Machine:** C64. **Price:** £9.99 (ret) £12.99 (dist). **Originality:** 3/10. **Playability:** 5/10. **Graphics:** 5/10. **Value:** 6/10.



well as pots that can hit and attach to and swing across Tazman style. If he manages to free all the children he can escape in a mine cart and into part two.

This is the shoddiest part of the game and is simply a ride in a mine cart down a broken track. When you come to a break in the track leaving over will avoid disaster, but may bring you into range of the Trigger guards or into the path of the pursuing car. This is an all-out nothing stage as taking a wrong turn will cost you a life but once you've learned the route it couldn't be easier.

At the end of the track you enter the Temple of Doom and can attempt to convert one of the Banko's stones. Once again you're attacked by Trigger guards and shattering snakes but if you get your timing right you can swing over the firey gauges, grab a stone and escape only to find yourself back in the mines with more children to rescue.

As a conversion the game is reasonably close to the original (although the music is terrible). Unfortunately, the original game rapidly became repetitive, and desperately needed three or four more bits. A good conversion but this has been better games to convert.

T.H.

Touchdown

Title: *Indiana Jones and the Temple of Doom*. **Supplier:** US Gold. **217 Marlford Way, Birmingham, B5 7AN. Tel:** 011-336 1588. **Machine:** C64. **Price:** £9.99. **Originality:** 3/10. **Playability:** 6/10. **Graphics:** 3/10. **Value:** 6/10.

Captain America

Ifan America is threatened with total annihilation who do you call. Superman? Ghostbusters? No! This time it's Captain America – the defender of the Constitution who must save the day!

Dr. Megalomaniac, a man who the CIA claimed they killed in Cuba in the early sixties has emerged from hiding and claimed the Presidency of the US of A, and if power isn't handed over he'll fire a nuclear parked full of killer virus at North America and wipe everyone out.

Indiana Jones and the Temple of Doom

Indiana Jones is set to burst onto the small screen in the C64 conversion of the Atari coin-op version of the film.

Armed with just his trusty whip Indy must fight off Trigger guards and snakes as he attempts a three stage game. In part one he must rescue children trapped in cages by whipping the locks off. These cages are spread throughout a cave network linked by ladders and ledges as

One hundred elite marines informed the mad doctor's base but were all killed by the deadly virus. Now you, Captain America, must save the world!

The doctor is holed up in the tube of Doom and it's not going to be easy to get him out. The tube of Doom consists of three concentric tubes packed with laser firing robots. Your mission is to fight your way through all three levels to destroy the robot, and bring Dr. Magnomani to justice. As the game begins you are sitting at the controls of the Orbitaler, an elevator that runs between the outer and middle cylinders. From this you can gain access to the rooms of the tube of Doom.



The deeper you get into the tube the greater the level of the virus that will slowly overcome you. Captain America's superhuman strength and so you must stay within your immunity range. You must also find a way to increase your immunity so you can explore these deeper levels.

Perhaps the answers lie in the rooms that you can reach by battling the robots in each level. Here you'll find many laser firing and bombing enemies as well as a scanner for your Captain America shields (your only weapon) and maybe even a few clues.

Captain America is a massive arcade adventure in which your reactions will have to match your brain power if you're going to survive long enough to save the day.

T.H.

Touchline

Title: *On Court Tennis*. **Supplier:** GSC, 2/1 Midford Way, Midford, Stroud, Gloucestershire, GL8 7AE. **Tel:** 029-126 1388. **Machine:** C64. **Price:** £9.99. **Originality:** 3/10. **Playability:** 7/10. **Graphics:** 6/10. **Value:** 5/10.

On Court Tennis

On Court Tennis is another of the Artvision Gamesstar games to be re-released by Firebird at a budget price. This time you can pick up your racket and stride on onto the court with as few, three, John or Jimmy to take on a

computer or human opponent in a match lasting three or five sets.

As the players take their places on court the temptation is to write the game off as having poor graphics but gradually the added verve of the gameplay takes over. Every when you're 5-0 down you still think you've got a chance!

The game is controlled entirely by the joystick with it's movements deciding the strength and direction of the shot. This, of course, depends on how well you time your shots and whether you play the right shot at the right time. Much that let us think about it's lucky that the computer automatically moves you to the ball so you can concentrate on the shot.

The result is a tennis game that was over priced in the full-priced market, but at last as found it's right value for money. It's limited and at times not very pretty but as a mid-price tennis game it has the advantage.

T.H.



Touchline

Title: *On Court Tennis*. **Supplier:** Firebird, 64/76 New Oxford Street, London WC1A 1PS. **Tel:** 01-379 6213. **Machine:** C64. **Price:** £1.99. **Originality:** 4/10. **Playability:** 6/10. **Graphics:** 4/10. **Value:** 3/10.

Beach Head II

Beach Head II, the game that shocked the world with it's realistic screens is back as part of Mastertronic's American range. In this, the sequel to the highly successful Beach Head the evil, sunning, bloodthirsty, power crazed marine dictator known as the dragon is out for revenge and plans to destroy the forces that wrecked his fortress in the original game, that means you.

As in Beach Head, Beach Head II is a multi-stage arcade game, only this time you can play either side in a head to head contest.

The first sequence is a two part game with the decoder making a massive gun that tries to blast the good guys as they're dropped by helicopter behind the first line of defence. Once they've all been dropped you must bring



them forward while running the gauntlet of the giant gun. If they're hit, they let out a bloodcurdling scream as you'll find a medal. As you approach the gun you can send one crashing over a wall while the gun will be destroyed but soon replaced so you have to move quickly.

In stage two you must rescue the men captured by the dictator by turning their own gun against them. This isn't going to be easy as the prisoners escaping across the desert yard can be hit by mine walls, blown up by mines thrown out from trap doors, killed by a truck or slowly and loudly crushed by a tank.

Part three is a Dragon style screen in which you must fly the escaped prisoners to safety in three helicopters, along as you can get past the Dragon's defenses and finally as part four, your in man to man combat with the dictator in his underground caves. To win you must find pointed sticks as the villain and escape his deadly throws.

Brach Head III is a fast, action-packed side-scan arcade game that won't win any good taste awards. **T.H.**

Touchdown

Title: *Touchdown* **Supplier:** Americans, 40 Paul Street, London SE7, Tel: 01-377 8880. **Machine:** C64. **Price:** £2.99. **Originality:** 4/10. **Playability:** 3/10. **Graphics:** 4/10. **Value:** 5/10.

Nebulas

Nebulas is yet another incredibly addictive Hewson arcade game in which you, as a little frog like creature, must destroy a series of unauthorised towers that someone has built in the sea. Your job is to climb up to the top of these towers and destroy them.

Unfortunately, this is going to be far from easy. You arrive by submarine at the base of the first of eight towers. Around it you can see a series of platforms and it's that you must navigate as well as tunnels that lead from one side of the tower to the other. Each tower is also patrolled by a selection of nasties. Some can be blasted with your bubble gun, while others are indestructible and must be avoided at all costs. This isn't always easy when you're walking along

platforms that disappear from under your feet, slide you backwards as quickly as you can run forward and gaps that are just further than you can jump.

If all adds up to a great game that adds new lease of life to the addictive platform game format. **T.H.**



Touchdown

Title: *Nebulas* **Supplier:** Hewson Consultants, Hewson House, 30 Milton Trading Estate, Milton, Abingdon, Oxon. Tel: 0215 615600. **Machine:** C64. **Price:** £2.99.

Originality: 4/10. **Playability:** 3/10. **Graphics:** 3/10. **Value:** 5/10.

Action Force

When the evil enemy Cobra attacked the small island of Bonanza, the military installations were destroyed. All except the eastern part which contains some classified information stored on hard disk. This data must not fall into enemy hands. There just isn't time to organise a conventional force attack so they must send in the Action Force.



Lady Jay and Crankcase man the A.W.E. Striker that has been quickly modified for data retrieval and so must be protected by you, Wild Bill, and Flint in the Dragonfly XH-1 helicopter.

The enemy will bombard you with other helicopters, planes, guns and missiles that you must blast and avoid while clearing a path for Striker.

The result is a standard sideways-scrolling shoot 'em up with eight levels that may have some appeal for Action Force fans. Anyone else who wants helicopter action should take Gunship for a test flight. **T.H.**

Touchline:

Title: Action Force. **Supplier:** Virgin Games, 3rd Floor Yard, Parkside Rd., London W11 2SE. **Tel:** 01-727 8878. **Machine:** C64. **Price:** £9.95 - disk only. **Originality:** 4/10. **Playability:** 6/10. **Graphics:** 5/10. **Value:** 6/10.

On the Tiles



Febird and Odo present the first 3D simulation in which you must prove the streets in search of fish bones to gain control of right streets.

Unfortunately, all is not perfect for our fatty hero who must avoid the attentions of blood sucking flies and the draining effect of frogs as well as the final touch of tiny hanks and bodgings. Luckily, you can regain lost energy by grabbing a sparrow or mouse as you leap from window sill to rooftop.

You can protect yourself from things that cost one of your nine lives by spitting some green unnamed substance at them. However, at times you don't have time to react since you must press the space bar in fly which is never near enough to the joystick to save myself.

On the tiles is a good but tough game which features some nice animation and addictive gameplay. **T.H.**

Touchline:

Title: On The Tiles. **Supplier:** Febird/Odo, 64/76 New

Oxford St., London WC2A 3PS. **Tel:** 01-379 6753. **Machine:** C64. **Price:** £7.95 (C) £12.95 (Disk). **Originality:** 8/10. **Playability:** 6/10. **Graphics:** 5/10. **Value:** 8/10.

Super Sprint

Super Sprint is the latest coin-up conversion for the C64 and attempts to recreate the arcade racing game that's been an amazing arcade hit.

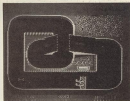
Unfortunately, it's impossible to get three players around a C64 and so this conversion has only a one or two player option with the remaining cars driven by droids. These droids never skid or crash but are easily beaten by a skilled player, but will wipe you out if you battle around every bend and end up in a smouldering heap. Your car is quickly replaced by one that arrives by helicopter but you will have lost valuable time.

Once you've selected one or two players (and if two either a head to head conflict or a normal super sprint) you can select one of the four tracks that feature tight bends, bridges that obscure your view and gates that open and close to allow you to take short cuts that could win you the race.

On the track you may also find oil slicks that will send you spinning, bonus points and occasionally gold sponsors. If you collect three of these sponsors in a race you can improve your car by adding super traction, turbo acceleration or a higher top speed or just improve your score with a score multiplier.

Whatever you choose even the experienced champions have to avoid the spinning whirwind that gets you in a spin if you're caught in it's path.

Super Sprint is a good conversion that will drive racing fans round the bend as they attempt to build a car that can beat all comers. **T.H.**



Touchline:

Title: Super Sprint. **Supplier:** Electric Dreams, Tremulous House, Tremulous Terrace, Southampton, Hampshire SO1 1JF. **Tel:** 0703 256664. **Machine:** C64. **Price:** £9.95 (C) **Originality:** 4/10. **Playability:** 8/10. **Graphics:** 6/10. **Value:** 5/10.

Teacher's Pet

Need some help with your studies? Then take a look at the latest educational packages. Learning can be fun!

By Margaret Webb

Following the dearth of new educational software over the last year or so, it's nice to have enough material to write another Teacher's Pet column. I want to discuss three packages which are all very different in subject matter. While the review copies all came on disks, there are no technical reasons to preclude their appearance on cassette. In fact, *Biology*, from Software Horizons, came with a cassette tape.

10/ACGSE Mathematics

The first package is written by Evelyn Math, a name which should be familiar to regular readers of *Four Commodore*. This package covers some of the main areas of the 10th level and GCSE syllabuses in mathematics. Extensive use of a graphics system called Video Basic 64 is used, which allows easy use of high resolution graphics, permitting the drawing of circles and lines and the use of fancy shading and patterns which is used to enhance the appearance of the package and illustrate certain aspects.

The software covers six main topics which include:

- Basic Mathematics.
- Algebra.
- Geometry.
- Trigonometry.
- Prepossession Mathematics.
- Trigonometry.
- Linear programming and statistics.

A final section provides a selection of questions extracted from past 'O' level exam papers. In keeping with most exam based educational software, the material provided is

more of a revision aid for use in conjunction with normal texts and tuition. To give you some idea of the content, I will run through two of the sections - geometry and algebra.

The use of high resolution graphics is put to best use in the geometry section. This section covers a number of topics which include circles, sectors, chords and tangents, plane shapes and polygons. The algebra section, on the other hand, requires less emphasis on graphics. The areas covered include law of indices, cross multiplication, removal of brackets, factorising quadratic equations and simultaneous equations.

The examination section is, as expected, fully testing and extends beyond the material given in the package. I think however, this is only to be expected.

All sections give a good mix of handy tips or rules of thumb and illustrative examples. There is, however, no error trapping, allowing ridiculous answers to crash the program. Some examples required input from the user - ensuring that he didn't fall asleep! Overall, the content is good and is presented in an interesting manner. Although it may sound boring, there was an interesting aspect.

All sections use Video Basic to generate fancy (and in my view) superfluous displays between topics. Some of these took some time to be drawn and became a little boring. My main objection is that these displays occupy valuable program space which could be used to better effect.

Notwithstanding this point, the

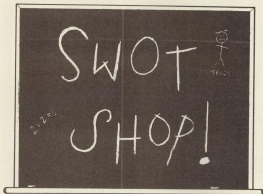
disk is filled well with something like 150K of software on it. One final point is that the examination section expects you to work from the monitor. This won't present a problem for those using their own copy at home but is of little value in a busy classroom since it looks up a machine which could be otherwise used. A better idea would have been to provide an option to allow you to make a hard copy of the examination questions and so that the computer could be released for other users. It would be necessary to return to the machine for the answers.

History Package

The next offering comes courtesy of Duncan Brown School, Ashford. This software uses the Quill adventure writer to create a novel approach to the teaching of History. History is usually a dull way to send pupils to sleep, as it is always full of dates, places and names and has as much life in it as a building brick.

The fact is that History is a living subject which involves people of all walks of life. By involving the pupil in the subject, it becomes live and interesting, and software uses the adventure concept to achieve this goal.

The disk contains two packages covering different aspects of the same problem. The main portion relates to an investigation of the past. The pupil has to "travel" around asking information which will help solve a Victorian murder. To achieve this aim, you must examine a wide range of sources of information such as



records, diaries, memorials, is cherished and taken to the group.

In the first part you have to compile the basic facts from archival material. You have access to contemporary material in the second part, and with this you attempt to form a case against the murderer. Two further parts provide further information and quiz your findings.

In the second package, the pupil has to explore a Scottish village and map it. The final aim is to compile as much information as possible about a family that lived there.

Overall, the main theme of the package is that there is a lot of material available which is used to explore the past and shows where it is found and how it can be used. The software is detailed and well thought out - the documentation is copious and extremely useful, providing teacher's notes and help for the pupils. The material is ideal for project work, both for groups of children and the individual. I believe that this software

is free provided that a blank disk or tape is sent.

Revision Series

Finally, I received some sample extracts from a series, written by Software Horizons, whose software is very much of the subject summary/revision genre. The system uses a kernel of routines which perform some fixed actions on a database. The database is specific to each subject. The format is text only with choices made from menus.

Each topic has a block of notes occupying two or three screen loads, which must be read in conjunction with normal notes. There are then a number of questions aimed at testing the pupil's knowledge. These are:

Simple questions: these simply require a typed answer to a question.

Multiple choice: three possible answers are given for the pupil to choose from.

True or false

Group questions: answers are chosen

from a given selection to answer a group of questions.

True one

Fill in paragraph: the pupil has to insert the missing keywords into a paragraph.

A nice touch is the program's ability to tolerate minor deviations in spelling. Overall this package does its job well, but due to the lack of graphics, is rather uninspiring.

Teacher

Title: O/V/GCSE Mathematics.

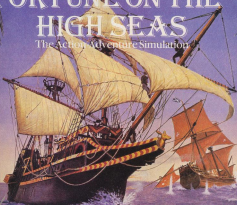
Supplier: Adamsoft, 18 Norwich Avenue, Rockdale, Lancs OL11 3JZ. Price £12.95.

Title: History Revision. **Supplier:** Mr J. Jamieson, Durran Brown Youth Way, Durran Brown School, Nantwich Road, Nantwich, Cheshire. Price: Four of charge.

Title: Revision Series. **Supplier:** Software Horizons, The Mill Centre, Main Street, Wicken Town, Co. Wicken, Ets. Price:

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Win a Konix Joystick

Konix is set to launch a new joystick onto the market. We're giving ten away as prizes in this month's competition.

The Konix joystick is probably the one of the best known joysticks available. Now Konix is set to take the market by storm once again with a new version of the joystick, now with an auto fire facility.

Four Commodore is pleased to team up with Konix for this month's competition. We are giving away ten auto-fire joysticks to the first ten correct entries pulled out of the hat after the closing date.

How to Enter

Study the two cartoons, there are a number of differences between them. Once you have decided how many differences there are complete the entry coupon and send it to the editorial address (see below). Please write the number of differences that you have found on the back of the envelope. If you don't then your entry will not be accepted.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications and Konix. This restriction also applies to employees' families and agents of the companies.

The How to Enter section forms part of the rules. The Editor's decision is final and no correspondence will be entered into.



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Enlarging the C64

Create User Definable Graphics to produce enlarged characters on your C64.

By Adam Wright

This program will enlarge any character up to a maximum square size of 8(width) by 8(height). In fact, as long as the combinations of width and height when applied to the formula $(width-1)*8*(height-1)$ is less than 255 then other size combinations can be created. If you can take into account the massive amount of memory that is used when creating enlarged characters then I'm sure that you will appreciate that the size combinations available are very acceptable.

The program creates UDG's (User Definable Graphics) which when pixed together in the correct order will produce the enlarged character. This program therefore works in the normal low-res screen mode. One advantage of this method of creating enlarged characters is that no hi-res screen areas have to be assigned. The disadvantage of this method is that the total number of characters displayed must not exceed 255. One way to overcome this limitation is to create the enlarged characters that are going to be used beforehand.

Getting it all in

In order to enter correctly the Enlarge program the following steps have to be taken:

- Enter program 1.

- Run the program making sure there are no errors.
- Save the program (SAVE "PROGRAM 1",II")
- Load the code by typing SYS #6613
- "ENL CODE",49(51,49571,1")
- Enter program 2.
- Save the complete program (SAVE "ENLARGE",II")
- Disk Users replace the 1 with an 8

How to use the routines

Enlarge Character

This is the main routine which as its name suggests, enlarges characters. Routines that must be called before calling this routine are:

Data Store, Character Data, Width, Height

SYNTAX - SYS EC

Print Character

This routine puts the enlarged character on the screen. Note that the normal print routine could not be used because as you will know, some ASCII codes do things like clear the screen, etc, therefore the characters are "POKE'd" into screen memory. Routines that must be called before calling this routine are:

Character Colour, Base Character, XY Position, Width, Height

SYNTAX - SYS PC

Data Store

This routine is used to set up the address for the enlarged characters - (default 12288)

SYNTAX - SYS DS, enlarged character address

Character Data

This routine tells the computer where the 8 bytes of character definitions are - (default 14136)

SYNTAX - SYS CD, character definition address

Character Colour

This routine simply changes the current enlarged character colour.

SYNTAX - SYS CC, colour of character

Base Character

This routine changes the initial character that is used as the base for the Print Character routine. (See example 1)

SYNTAX - SYS BC, base character number

XY Position

This routine changes the enlarged character coordinates.

(Not to be confused with CARGOR MOVZ)

SYNTAX - SYS, XY, X coordinate, Y coordinate

Width and Height

This routine sets up the width and the height of the character to be enlarged.

SYNTAX - SYS WH, width of character, height of character

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screen of the VIC quite easily, but you have to remember BASIC isn't prepared for this, so you may have to write special routines to make this possible. First let's try to make the screen smaller horizontally, by:

POKE 54784:POKE 54785,75

The number of characters displayed has changed to 75, but it doesn't quite work because the spare five columns are printed on the next line. So we must spare five to digitize 25.

POKE 54784,27:POKE 54785,5

This solves the problem by adding five lines to make the total equal 75+5=80. The maximum number of characters is 48. We can also change the number of vertical characters using register 6.

POKE 54784:POKE 54785,10

No problems this time. The rest of the screen is swallowed up, a screen though it is still there if you store 25 in register 6. Now try this:

POKE 54784:POKE 54785,28

Wow! My new screen to have 28 lines, although they can't be used yet, and probably contain garbage. In fact we can have up to 32 lines although some monitors may not be able to display them all, so it's best just to add a few. Also, if you change the size of the screen it would be useful if you could centre the display. Well, you can of course. Just use registers 2 and 7 to change the horizontal and vertical syncs respectively. It's best to experiment and I would recommend that your programs that change the size of the screen allow individual users to alter the syncs for their individual monitors.

Like the 48-column screen, the 80-column has an attribute screen, but with some added features. Each of the 2000 bytes (see fig) can affect the corresponding byte of screen RAM, the individual bits mean:

(see Figure 3)

Bit 0 indicates which character set is in use.

Bit 1 Reverses characters, but not used by KERNAL.

Bit 2 is used to underline characters (CTRL U).

The bits 3 flashes characters on and off.

Bits 4 - 5 are used for the colour values.

It is also possible to change the position of the screen and the

Figure 5

Copying the VIC RAM from place to place. Store the destination address in 250 and 251, the number of bytes in Acc. Also, store the source address in 252 and 253.

```

loop PHA                /temp store number of
LDX #24                /bytes then set
JSR read               /copy
ORA #128               /bit
JSR write              /and write,
LDX #18               /size
LDA 251               /destination
JSR write              /address
INX                   /high
LDA 250               /then
JSR write              /low,
LDX #32               /size
LDA 253               /source
JSR write              /address
INX                   /high
LDA 252               /then
JSR write              /low
PLA                   /get number
LDX #30               /of bytes
JSR write              /and store
RTS                   /return

```

Figure 4

VIC RAM organisation

80000	- 801CF	Video RAM, 2000 bytes.
807D0	- 807FF	Not used.
80800	- 80FCF	Attribute RAM, 2000 bytes.
80FD0	- 80FFF	Not used.
82000	- 83FFF	Character RAM, 8392 bytes, two character sets, 16 bytes per character (8 not used).

Figure 7

Altering underline scan line.

```

10  graphic 3.1
20  for i=0 to 28
30  char, 24,chr$(27+"How to under line text
   on the VIC")
40  next i
50  do
60  for i=1 to 8
70  poke 54784,28+int("register 28")
80  poke 54785,i
90  for d=1 to 25:REM "delay loop"
100 next d
110 next i
120 loop

```

attributes, as long as you tell the interpreter, which gets the information from a readout about \$A.21 in each page. You will need to do this if you enlarge the screen. You change these via functions 17 and 13 (screen, 20 and 21 (attributes) of the VDC).

For those proud owners of monochrome monitors you can do away with the attributes altogether and use register 26 for the foreground and background colours. To do this you must clear bit 4 of register 25: `POKE $A784,15;POKE $A785,7`

No difference? Well, not yet, but try the program from figure eight. Bypassing the attributes also allows you to utilize more memory for anything else.

Another feature of the VDC is the ability to change the size of the characters. This could be used as a special effect or just to amuse your friends! The registers controlling the size of the characters are 32 and 33 (bits 0-3). However, at present the system can only display up to a maximum of 8 by 8 pixels. But there are 16 bytes per character in the RAM so does this mean that a larger grid is possible? Try this:

```
1 POKE $A784,9;POKE $A785,15
2 POKE $A784,6;POKE $A785,16
3 POKE $A784,23;POKE $A785,15
4 POKE $A784,4;POKE $A785,16
5 POKE $A784,7;POKE $A785,16
RUN
```

So, it is possible to display an 8 by 16 grid, but what about 16 by 8, I'm afraid I haven't figured out how to do that, and I don't think it's possible.

Remember smooth scrolling on the VIC, well it's also possible on the VDC, using registers 24 and 25 for vertical and horizontal scrolling respectively. Notice that 16 bits can be scrolled in the horizontal plane. If bit 4 of register 24 is set then only 32 lines (as opposed to 25) are displayed so you can scroll the next three on. Also, you don't lose lines when scrolling on the VDC, try the program in figure nine.

The cursor is, as mentioned before, controlled by the VDC and has several registers controlling it, namely 14, 15, 16 and 11. Registers 14 and 15 define the address the cursor has. Register 16 bit 3 and 6 indicate the cursor mode: 00 - The cursor is still.
01 - The cursor is off.
10 - Fast blinking.
11 - Slow blinking.

Bits 0-4 indicate the top line of the cursor, because you can define it as underline, overline, solid, or anything you like. Register 11 defines the end

Figure 8

Changing the character size.

```
10 graphic 3,1
20 input "What is your name?";read
30 read: " "
40 rti=3000/len(read)
50 write
60 poke $A784,22;poke $A785,112
70 poke $A784,23;poke $A785,8
80 for n=1 to rti
90 print read;
100 wait
110 for n=1 to 10
120 for m=0 to 8
140 poke $A784,22;poke $A785,1134-n
150 poke $A784,23;poke $A785,n
160 for d=1 to 30
170 wait d,n,n
180 sleep 3
190 end
```

Figure 9

The VDC scrolling registers.

```
10 graphic 3,1
20 fast
30 for m=0 to 24
40 chat,27,"Hello all you C128 owners!"
50 wait
60 do
70 for n=0 to 7
80 poke $A784,24
90 poke $A785,32+n
100 for d=1 to 60
110 wait d,n
120 loop
```

Figure 10

The cursor mode.

```
10 fast
20 poke $A784,14;poke $A785,5
30 for m=0 to 85 step 32;rem "bits 5 and 6"
40 poke $A784,10;poke $A785,2+m
50 for n=0 to 39
60 poke $A784,14;poke $A785,8
70 poke $A784,15;poke $A785,n
80 for i=1 to 20;rem "change delay to suit yourself"
90 wait d,n,n
100 end
```

your line. Both are from 0 to 15. See Figure 18 for an example of the cursor mode.

And now we come to the highlight of this article. Want to know a secret? HIGH RESOLUTION (01000000)? Yes, bit 7 of register 25 defines text or graphics mode and normally the hires mode is 040 by 200. This is comparable to the BBC mode 0 graphics, and is quite impressive. However, you will have to write your own graphics routines as Commodore forgot, although I saw a package at a Commodore show which could handle hires graphics in 80 column mode. Try this:

```
POKE $A784,25:POKE $A785,135
```

However, if you want to see 60/84 bytes instead of 160/80 then try this:

```
1:POKE $A784,1:POKE $A785,64
2:POKE $A784,2:POKE $A785,46
3:POKE $A784,6:POKE $A785,22
4:POKE $A784,7:POKE $A785,26
5:POKE $A784,25:POKE $A785,135
```

This gives graphics at resolution 342 by 256. I use this a lot more because you can use a technique used on the BBC. Remember registers 12 and 13? Append this to the above program:

```
6:DO
7:FOR T=0 TO 60 STEP 2
8:POKE $A784,13:POKE $A785,T
9:FOR S=0 TO 80 NEXT S,T
10:LOOP
```

What this program does is move the start of the screen, and as the screen wraps exactly 16K bytes then it will wrap around in memory. This is a great feature and scrolling becomes easy. This procedure would be to change the start of the screen instead of scrolling memory, which makes scrolling easy and quick. Also, if Commodore had thought to give the VDC some more memory (quite possible), say 32K bytes then it would have been possible to have displayed 640 by 400 or 512 by 512 pixels resolution using the interleaved graphics mode on register 8. Try poking 225 to this register!

Well, that's all I have to say about the VDC, and I assure you that there is a lot left to find out, and special effects to find. One final possibility that I thought about was to use the 16K bytes as storage for music data, etc. Also, you can use the VDC in 64 mode (as well as the 2 MHz mode). For other information on the VDC refer to one of the good C128 reference guides or *The Anatomy of the Commodore C128*.

Figure 11

A complete list of the VDC registers.

0 :	(128)	Total number of characters/line including beam return.
1 :	(180)	Number of characters displayed across screen.
2 :	(162)	Left border sync. Increasing this register moves the screen left.
3 :	(171)	State shifts. Bits 0-3 determine hor. sync pulse width in characters, bits 4-7 determine vert. sync pulse width.
4 :	(180)	Total number of lines including beam return.
5 :	(234)	First adjustment for register 4.
6 :	(25)	The number of vertical lines displayed.
7 :	(15)	Upper border sync. Increasing this moves the screen up and decreasing it moves the screen down.
8 :	(202)	This register determines the interface mode.
9 :	(211)	Bits 0-4 determine the number of raster lines/character minus one. The default is 7 (bits not used appear as 1) meaning 8.
10 :	(160)	Bits 5-6 set cursor mode and bits 0-3 set cursor start raster.
11 :	(221)	The line at which the cursor ends is held in bits 0-4 (normally 7).
12 :	(0)	The high byte of the address of the screen.
13 :	(0)	The low byte of the address of the screen.
14 :	(077)	The high byte of the cursor position.
15 :	(077)	The low byte of the cursor position.
16 :	(077)	The vertical address of the light pen.
17 :	(077)	The horizontal address of the light pen.
18 :	(077)	The high byte of the address to be copied, written to or read from.
19 :	(077)	The corresponding low address of REG 18.
20 :	(0)	The high byte of the attribute screen.
21 :	(0)	The low byte of the attribute screen.
22 :	(120)	Bits 4-7 determine the number of displayed horizontal lines (7). Bits 0-3 determine the number of vertical displayed lines (0).
23 :	(232)	Number of vertical lines displayed (height).
24 :	(32)	Bit 7 sets VDC whether copying, reading or writing. Bit 6 is the REV bit, used by <ESC> = R and <ESC> = M. Bits 4 scrolls up the last three lines of text as vertically. Bits 0-3 are used for vertical scrolling.
25 :	(71)	Bit 7 indicates high or low res. mode. Bit 6 indicates the use of attributes. Bit 5 determines semi-graphic operating mode. Bit 4 indicates double width characters. Bits 0-3 are for horizontal scrolling.
26 :	(240)	When in monochrome mode (bit 6 of REG 25), bits 0-3 determine background colour, and bits 4-7 indicate foreground colour.
27 :	(0)	The number of characters added to the end of each line. If you make the screen smaller you must make sure REG 1+REG 27=58.
28 :	(47)	Character base address (bits 3-7) is 8K steps.
29 :	(231)	Indicates which line to underline, and can be from 0-15.
30 :	(077)	Number of bytes to be copied or stored.
31 :	(077)	Holds data for reading or writing to RAM.
32 :	(077)	High byte of start address of block to copy.
33 :	(077)	Low byte of start address of block to copy.
34 :	(125)	Number of characters from start of line to first character to be displayed. Can be used to cover left edge of screen.
35 :	(64)	As REG 34 but for right edge of screen.
36 :	(245)	Bits 0-3 indicate the DRAM refresh rate.

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Array Display Subroutines

Create a screen input and display routine which acts on

string arrays, with this handy program.

By Paul Williams

When writing business packages or other programs for various applications, it is often necessary to have screen layouts containing a list of data all at the same time. For example one record in a database program or the description of one item in a stock control package.

The best way of entering and modifying the data is for the user to be able to move a cursor around the various fields on the screen, using the screen editor to amend the data. However, the cursor must not be allowed to stray outside each field, otherwise it would be very easy for the user to corrupt the screen, and if the user was not familiar with computers, become very confused.

The program described here is a screen input and display routine which acts on string arrays, providing the following advantages over the normal BASIC INPUT command, while still being easy to use.

1. The programmer defines the field positions and sizes on the screen, and it is impossible for the user to stray out of these fields when editing.
2. When editing, the current field is highlighted to show the user the maximum size of entry expected by the program.
3. Left and right cursor controls, home, clear and insert and delete can all be used when editing, but only affect the current field, even if other fields are present on the same screen line.
4. Up and down cursor movements automatically move the user to the previous and next fields on the screen.
5. Apart from the allowed control characters, only letters, digits and characters such as ! and % etc are accepted.
6. Quotes, commas and colons are all readily accepted as legitimate input characters, and do not cause TEXTA IGNORED errors.

7. The programmer can specify that editing is restricted to one particular field, or all the fields on the screen.

8. All the fields on the screen can be displayed or cleared with one command. Also, editing the whole screen is performed with just one command.

9. The whole system produces very neat screen displays, allowing editing to a professional software standard.

The program relies on three one-dimensional arrays for its operation; a field position integer array `PS`, a field length integer array `L%`, and a data array `S$` containing the information to be displayed and modified. The array names are arbitrary - you can use any letters but the two numeric arrays must be integer.

Array `PS` contains the displacement of each field from the top left home position on the screen, e.g. the first column on the second screen line is a displacement of 48 from the top, and the middle of the bottom line is 948. Thus, `PS(1)` defines the location of field 1, and `PS(2)` defines that of field 2.

Array `L%` defines the maximum length of each field - this number determines the size of the highlighted area on the screen and the number of characters strings are truncated to when being displayed by the routine. `L%(1)` contains the length of the first field, and so on.

It is also necessary to set `L%(0)` to the number of fields present on the screen.

Array `S$` simply contains the ASCII strings of data to be displayed; the routine directly modifies the elements of `S$` when editing is taking place.

Once the arrays have been defined, the subroutine is executed in this way: `NS449152,PS(1),L%(1),S$(1)`

(or whichever array names you have chosen) displays the elements of `S$` in their respective fields.

`SY549152,PS(0),L%(0),S$(0)`

allows the user to edit the data in the fields on the screen. The user can move between fields with the cursor up and down controls, and when RETURN is pressed the data in the fields is put back into the elements of array `S$`. Editing and movement can be restricted to any field `N` by `PS(0)=N` before the above `SY549152` command, if `PS(0)=0`, editing is allowed in all the fields.

`SY549158,PS(0),L%(0),S$(0)`

clears all field areas on the screen.

The main advantage of this system over normal INPUTs is that if the user has a lot of data to enter on the screen, it is possible to go to the end of the screen, then decide the top record needs modifying, and the cursor controls can be used to skip across the fields to reach that field. The Basic program is held up until the user is completely satisfied with the whole screen, then he/she presses RETURN and all the data is returned to the Basic program in one go.

The machine code program occupies locations 8C080 to 8C126 (hex), and a Basic loader is listed. This contains checkmarks which will point out typing errors when this program is run. Over the program has been installed using this loader, your Basic program can make full use of the package. To demonstrate how the routine is used, a Basic program has been included which draws up a typical stock-control screen and allows full-screen editing restricted to the defined fields. The program is fully commented and should need no further explanation.

The routine is ideal for taking the struggle out of writing business-type packages - after all databases and such like can quite easily be written effectively in Basic, as long as a fast-paced and easy to use input routine is available - this program provides just that!

See listings on page 77.

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C64 Tape System

*Provide a menu driven access to multi-program library
tapes with this handy program.*

By Richard Kyme-Wright

Have you ever put more than one utility or backup program onto a single tape? Have you then forgotten to note the tape counter setting at the start of the second program and had to fish around on tape looking for it?

Unless you are one of the chosen few, or you rigidly use one tape per program, this utility is for you.

The program offers a selection menu of the titles of programs stored on the tape. When a selection has been made, the tape will be spooled to the start of the selected program and the LOAD sequence commenced.

The difference between this tape-accessing system and any other I have encountered is that there is no need to REWIND the tape to the beginning for a fresh look at the menu. This menu occurs between the programs so that it is ready to use at any time.

Tape Layout

When you have loaded a program the tape stops at the end of that program and before the start of the next. This is the perfect spot to find a menu. From this menu, any other point on the tape can be reached by spooling fast forwards or using rewind. A menu is also placed at the start of the tape to act as a "registration" point that you can easily find if you do manage to get lost.

Limitations

The C64 tape system is only effective when a tape is being used as a library for your routine programs and utilities. These programs must all be set up on the tape before the tape system is added. To change the content of the tape or to update a program involving a change in its length would corrupt the layout on the tape and a new tape would have to be set up.

The system can accommodate as many programs as the tape can hold. During the setting up, however, the menu programs you have assembled onto a tape the greater the number of

spool-time intervals to be measured will be, and the necessary increase in data statements will make the menu program longer to size and take longer to load.

The spooler has been compacted to occupy a minimum number of bytes (2444 bytes for the six title versions.) This takes 62 seconds to load normally but can be cut down to 40 seconds when using a turbo-charge program or utility cartridge. (Ten seconds to "load" when I use Final Cartridge II.)

The spooler will close off by investigating the normal loading commands of the C64 when the tape has been spooled to the correct position. The method of calling the next program can be tailored to meet individual program requirements. See Figure 1 for details of this.

Setting up the tape

Type in and "save" the two programs listed here. Note that these are two separate programs and not two parts of the same one.

Place a good quality audio cassette in your 2M cassette unit and reset the counter to 000. Use fast forward to advance the tape past the leader strips, give yourself some spare tape at the start so stop it at a counter reading of, say, "040". There should be enough tape spooled to save the "menus" or "spooler" programs at the start of the tape and not run past this point. At "000" save the first program in your library. Note the counter value at the end of the "save" then use "play" to move the tape forward for "30" seconds to leave a space to save the spooler later.

Use an appropriate shorter time interval if you are utilizing a fast-save utility. The tape is now at the start point for the next library program. Build up your tape in this manner until you have the required number of programs on the tape, and leave enough room at the end of the tape for a final spooler program.

Now I recommend that you rewind

the tape, reset the counter and load each program in turn. Check that the programs load alright and that the counter values agree with your notes. Note that the true start point for each program will be 70 seconds (or less) beyond the end of the previous program and not at the point where your C64 announces to you that it has loaded something.

You now have all the information you need to measure the time it takes the cassette drive to spool between any two of the start settings.

Running the timer program

The TIMER program has to be saved at the very start of the tape. Instructions on its operation are displayed as you go along. Proceed as directed and make the necessary notes on the spooling times chart. Remember, read the tape counter while the tape is being spooled, press space bar as it approaches the required value as the tape will overrun slightly when switched off. This will take a little practice to get right.

Use the chart layout as suggested in Figure 2 to record getting lost between the different programs on the tape. Record the timer values obtained from a rewind as negative values and those from fast forward as positive values. Note that the last line of the chart is set with all negative values. This records the rewinding time to reach the start point of each program from the forward end of the tape. This point is 70 seconds of "play" time (or less) beyond the end of the last program. Make a record and refer to Figures 2 and 2.1 for more details.

Setting up the spooler program on the tape

When your chart is complete LOAD the spooler program (do not RUN it as it will reset itself with NEW when it finishes). List out line 10s and replace

the text found within the quotation marks with the general title for this tape. (Overtype the text then press RETURN.) Do not use the INSERT or DELETE key as the layout of the screen would be corrupted.

Overtype the text on the data statements beginning at line 74 with your program titles in their order on the tape. This is the point where you can tailor the spooler program to the actual contents of your tape.

If the number of titles is six or less use lines 74 to 88 as given in the listing. Type in all six titles or, if less than six, put in spaces of text on the unused data lines. Select the appropriate method of loading each program from the chart in Figure 1, and put the relevant code into each title line after the comma. Take the first line of numbers from your chart of spool times and type them over the "+0000"s as line 80.

Your data lines should look like this for four titles:

```
74 DATA" 1: PROGRAM TITLE
ONE " :1
75 DATA" 2: TITLE OF PROGRAM
TWO " :2
76 DATA" 3: HERE IS PROGRAM
THREE " :3
77 DATA" 4: PROGRAM FOUR " :4
78 DATA" " :0
79 DATA" " :0
80 DATA+0000,+0340,+0732,+13
52,+0000,+0000
as this for six titles
74 DATA" 1: PROGRAM TITLE
ONE " :1
75 DATA" 2: TITLE OF PROGRAM
TWO " :2
76 DATA" 3: HERE IS PROGRAM
THREE " :3
77 DATA" 4: PROGRAM FOUR " :4
78 DATA" 5: THE FIFTH
PROGRAM " :5
79 DATA" 6: PROGRAM NUMBER
SIX " :6
80 DATA +0000,+0340,+0732,+13
52,+1760,+2321
```

If more than six titles are required use line 79 (item 5a) for the NEXT SELECTION option and set the code at the end of the line to "F". (This triggers the program to the next page of titles.)

Retype the data lines as in lines 74 to 80 starting with the new line number of 81.

Item six must again be the NEXT SELECTION option and if this is the last page, set the code at the end of the line to "F". This makes the display return to the initial selection.

```
74 DATA" 1: SOUND CREATOR " :2
75 DATA" 2: SOUND MAKER " :3
76 DATA" 3: SOUND SEQUENCER " :2
77 DATA" 4: MUSIC THEMES ALBUM " :1
78 DATA" 5: MUSIC HITS, ALBUM " :1
79 DATA" 6: ----- NEXT LIST ----- :9
80 DATA+7650,+0500,+0100,+1830,+2410,+0000
81 DATA" 1: MELODY TIME, POP HITS " :1
82 DATA" 2: SYNC. SYNTH. CLASSICS " :1
83 DATA" 3: TUNES FOR YESTERDAY " :2
84 DATA" 4: TUNES FOR TOMMOROW " :2
85 DATA" 5: TUNES FOR TODAY " :2
86 DATA" 6: ----- NEXT LIST ----- :9
87 DATA+3170,+3920,+4670,+5210,+5860,+0000
```

In the second example I have gone a stage further and used eleven titles spread over three pages!

```
74 DATA" 1: SOUND CREATOR " :2
75 DATA" 2: SOUND MAKER " :3
76 DATA" 3: SOUND SEQUENCER " :2
77 DATA"NOTE ABOUT HARDWARE PUT HERE!! " :5
78 DATA"----- " :0
79 DATA" 6: ----- NEXT LIST ----- :9
80 DATA +8100,-0765,+0000,+0000,+0000,+0000
81 DATA" 1: MUSIC THEMES, ALBUM " :1
82 DATA" 2: MUSIC HITS, ALBUM " :1
83 DATA" 3: MELODY TIME, POP HITS " :1
84 DATA" 4: SYNC. SYNTH. CLASSICS " :1
85 DATA"----- " :0
86 DATA" 6: ----- NEXT LIST ----- :9
87 DATA+1830,+2410,+3170,+3920,+0000,+0000
88 DATA" 1: TUNES FOR YESTERDAY " :2
89 DATA" 2: TUNES FOR TODAY " :2
90 DATA" 3: TUNES FOR TOMMOROW " :2
91 DATA" 4: TUNES THAT NEVER WERE ... " :2
92 DATA"----- " :0
93 DATA" 6: ----- NEXT LIST ----- :9
94 DATA+4670,+5210,+5870,-1870,+0000,+0000
```

Figure 2: chart layout for recording
Time values

Figure 1: the options available to the spooler when it hands over to the LOAD sequence.

CODE	LINE	Produce the following response
1	68	Hold down Shiftkey and press RUN/STOP 'READY'
2	69	LOAD" " :1 < return > PRESS PLAY ON TAPE
3	62	LOAD" " :1 < return > PRESS PLAY ON TAPE
4	63	
5	64	
6	65	
7	66	

Space is available in lines 63 to 66 to define any other load variations you require.

Of course, if your list of titles continues, lines 63 to 67 will be full and the block of lines 74 to 80 can then be repeated again on new lines 88 to 94.

Here are two examples adapted from one of my own applications. In the first, there are ten titles on the menu and options six through "page" is used to turn to the list on the next "page" (or to go back to the first "page").

In this second example I have gone a stage further and used eleven (eleven) years over three 'years'.

It is important to note the timer values are not in sequence in lines 60, 61 and 64 as the data have been grouped by subject and not by the position on the tape. Each timer value must correspond to the program title in the list that creates it. (Type in these data here and run the program to see how it handles them. Change the NE 50 command in line 71 to a STOP command first or your experiment will involve a lot of *TIME*.)

With the data lines set up, start the speaker program using the fast-out facility (if you have one) at the appropriate position before the start point of the first program. Next speed forwards to the end of that program, using the tape counter and your notes for guidance.

List speaker to your screen then overtype the timer values (lines 83, 87 etc.) with the second set of figures from your timing chart then SAVE speaker at the tape position you have now reached.

Continue this process until speaker has been saved between each program on the tape and once more after the last program using timer values that are all one.

Begin with the tape positioned at the start of one of the programs by setting the tape to the tape counter value noted for that program on the left of this chart; speed to the start point of a program listed along the top, and record the timer value displayed by the speed timer program in the appropriate box on the chart. See Figure 2 for an example.

This chart can be expanded to accommodate any number of programs as long as there is one column per program and one line more than the number of columns.

Figure 2.1: This is an example of the chart when partly filled in. The top and left side of the form is used for naming

[illegible]

PROJECT NAME	1	2	3	4	5	6	
1	→(0000)→	01	00	00	00	00	
2	→	→(0000)→	00	00	00	00	
3	→	→	→(0000)→	00	00	00	
4	→	→	→	→(0000)→	00	00	
5	→	→	→	→	→(0000)→	00	
6	→	→	→	→	→	→(0000)→	
7	→	→	→	→	→	→	
	TIMER VALUE						

[illegible][illegible]

Thesis – Process Description

Line	Description of process
100	Set up background and border colours
110-210	Paint screen layout
220	Deposit character on last position of screen
230-300	Display instructions on the screen, reset the key/b'd register
310	Read keyboard character
320	If character=I.... (GMT)
330	If cassette "STOP" key has been used....
340	If character < > space bar....
350-430	Paint timer box on screen
440	Set up timer reference, start spooling the tape
450	Calculate elapsed time
460-570	Display elapsed time, LOOP until space bar is pressed
580	Stop spooling the tape
590	Display prompt "PRESS RETURN to RESET TIMER"
600-630	Read keyboard character, respond to "RETURN KEY" and "I"
640-650	Display prompt "READY FOR NEXT" and reset timer display
660-690	Read keyboard character, respond to "I", "STOP", "SPACE BAR"
700	Reset timer value and go to line 450 (LOOP)
710	BUZZ and FLICKER error procedure
720-750	Display the error message
760	Exit from the program = END

directly large constant values for the start values of each recursive process.

For more information on this program, call 1-800-451-7273.

The next speed time to be measured is the one between the start of program four back to the start of program two.

These authors suggested that although the

number "100". Press the rewind key and then the space bar. Press the space bar again when the counter runs back past "37" to allow the tape to come to rest at "35". Note down the timer value in the box marked "TTTT". (I got a timer value of "0.060" for this one.)

The Best of 1987

Whether you are looking for a present to buy or want to treat yourself, you'll find something in our list of favorites from 1987.

By Tony Hetherington

It's been a great year for games with more American giants setting up shop on these shores. Soon you won't have to wait for the latest game from Electronic Arts, Microprose, Origin or Infocom as they'll be released simultaneously here and in the States.

This top ten has been compiled by the marks given by the reviewers of each game of the month. For a full review check the relevant copy or contact our back issues department.

California Games/ETC/S&W Gold/£9.99 (also £12.95 disk). The fifth and finest of the power games that started in summer, passed through Winter and then went around the World. Now California games takes you through six new stacked sports that feature skateboarding, foot bagging, surfing, roller skating, BMX racing and finally dribble flinging.



Sentinel/Treblead/£9.95.

A battle of skill and strategy pits you against the enemy absorbing Sentinel across a staggering 80,000 landscapes. Your aim is to get to the highest peak and absorb the Sentinel before it gets you.

The Last Ninja/System 3/£9.29.

In what must be the last word in martial arts games you have to punch, kick and kill an increasing variety of

opponents with a growing arsenal of weapons that are strewn about the glorious graphic landscapes. If you're into combat games that get the Last Ninja, it beats the opposition.



Dread/Treblead/£9.95.

Dread was the best of the Gauntlet clones as it added the use of spells to top down scrolling adventuring. Our hero has to battle with ghosts, baddies and demons to reach chests that contain magic spells and potions that replaced lost energy. When you opened a chest you were faced with a dilemma of which of the powerful spells you should choose. Should you collect more fire, water or electrical attack spells, grab a key or open the Golden, a faithful servant, that could be played by a second player? If you haven't got a copy of Dread yet, then there's no dilemma, buy one.

Gunship/Microprose/£14.95 (also £9.95 disk).

Gunship took flight simulators to new heights with a combination of an easy to fly helicopter that bristled with weaponry and an addictive gameplay that included flying over 100 missions throughout the warzones of the world. If you succeeded in wiping out enemy command posts, tanks, helicopters, gun emplacements and infantry you could gain promotions and medals and progress to more daring missions.

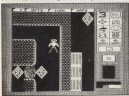
Stiffup and Co./Palace/29.99 cassette/£12.99 disk.

Stiffup and Co. brought good eggs, cucumber sandwiches and stiff upper lips to the wicket of adventures as four all round heroes set off in a South American banana republic to stop some bandits destroying the world. You'll have to keep a straight bat and wits sharpened if you're to survive the onslaught from Generals and other jungle types. Some of these can be solved with logic, others will need the old thinking cap.



Repton 3/Superior/29.95.

A boarderish style of game in which you must collect diamonds and a golden crown to progress to the next level while avoiding plummeting rocks, hatching monsters and ghostly ghosts. A great game if you can keep your nerve. If you can't, you'll soon be given a crushing blow.



Killed Until Dead/Ascolade/US Gold/29.98.

Murder, mystery and mayhem lie in store as the Midnight murder club has just booked into the hotel where you're the house detective, and they're all out to prove that they're the world's greatest murderer. Luckily, you're the world's greatest detective and with the help of security cameras and live video breaking in rooms, you just might solve the 20 cases supplied on the game tape or disk.



Pirates/Microprose/£14.95.

The first ever sea-buckling simulation takes you to the high seas as you take command (right fat command) of a pirate ship. From there you sail the seven seas in search of treasures to plunder and battles to attack. You can opt to be an all out pirate and steal from any ship or instead become a privateer and serve King and Country which means you plunder ships from the rest of the world. A superb simulation that's easy to get into despite the daunting task of a 90 page instruction manual!



Gumbel/US Gold/29.99.

The peak of the coin-op conversions that gives you 512 dungeon levels to explore as you battle with ghosts, giants, hobbers and sorcerers. This excellent game is now just part of US Gold's Solid Gold compilation which is this month's game of the month.

FOUR FEATURED ADD-ONS.

Are you happy with your computer system or do you want to stretch it a little further? If so, here are four add-ons that Your Commodore has featured in the last year.

Accelerator 4/Revolution Micros/£199.95.

Evolution Micros produced an alternative to the large and lumbering Commodore 1341 disk drive. The Accelerator 4 is smaller and slimmer, compatible with nearly all disk software, claims to be up to 25% faster and costs £40 less! Telnet Adapter/Micros/299.95.

Telnet is the information service that's broadcast alongside BBC and ITV programs. Until now you had to buy a

specially adapted TV to receive this information but thanks to the Microsoft Instant Adapter you can use your C64. You can not only read the pages of news, results, reports and TV listings but also use the information in your own programs thanks to a screen reading utility, **LOAD-HIT/Load-HIT/18.85**.

Available either ready fitted or as a kit for £10 less this little device could save you hours of anguish as you watch tapes not loading. By simply turning a graduated switch you can adjust the angle of the read head in your cassette and load in nearly all those programs that you thought were unavailable.

Eprommer 64/Dave/Electronics/£19.99.

Together with Dave's Cartridge Development system (£12.99) you can now create your own cartridges by down loading your programs onto an Eprom and then building it into a cartridge. Push your new cartridge into the C64, turn on and there's your program ready to use. With full, easy to follow instructions you can't afford to ignore Eprom programming.

BUSINESS AND UTILITIES

More and more people are using their computers for more "serious" applications rather than word processing, storing information or devising amusing graphics. Here are two programs that we have featured in the *Power Generation* that will put your C64 to work.

Mini Office II/Databases/£14.95 (also £18.95 disk).

Mini Office II is a package that represents excellent value for money as it includes a word processor, database, spreadsheet, graphics utility, notes pack and label printer all for the price of one. The menu-controlled package is easy to use, fully compatible and a must for all users.



Stop Press/AMX Software/£39.95.

Available on its own or with the AMX module for £69.95, Stop Press is a flexible desktop publishing program that can take text from any PET ASCII file and then print it in a variety of fonts and combine it with a library of clipart. The results can then be printed out to form a newsletter or used for lettering.

Advanced Art Studio/Bainford/£24.95 (disk).

The Advanced Art Studio is the first of two graphics packages featured in this roundup. Based on the original window and pull-down menus of the Art Studio, it includes added features such as support for multi-colour mode, user

defined brushes that can include four colours and can be 12x16 pixels big and last, and save and send windows of the screen as easy to build up picture elements.



Mini-Click/ICL/£39.99.

A combined business package for the C128 puts this machine to work and turns it into an essential workstation for all small businesses. The package not only contains a word processor, spreadsheet, cash book and database but a bonus can be expanded through extension packages that include a sales ledger, purchase ledger and payroll.



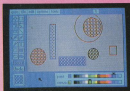
Logotron 128/Logotron/£12.95 (disk).

A trio of packages that have been tailor made for the British market from the American Spinaker originals. Planner 128 is a particularly comprehensive spreadsheet program and is matched by Writer 128, and Filer 128, both forams of use and value for money. Could this trio become the Lotus 1-2-3 of the C64 world?



Easy Money Planner / Softmark/Microware UK/£29.95.

GEOS, the Graphic Environment Operating System, took operating system fun brought windows and icons to the C64 earlier this year. Now through a new importer the cost has come down and the original system has now been joined by Writers Workshop, Grefile, GeoCalc and more fonts and desktop utilities, including a graphics grabber that can take Newsroom and Print Shop graphics.



Video Title Shop / IS Gold/£14.99.

A graphics package and a screen animator combine to form

a package that can be used for anything from a title page for the video of Fred's birthday to a full advertising demo. The text and graphics are created on screen where they can be animated in a variety of ways and stored either on disk or recorded onto a video.



The Image System / CRL/£24.95.

Described as one of the best graphic programs available for the C64 the image system uses the now standard method of joystick control and has a variety of menus from which you can draw, fill and colour shapes, as well as the manual image menu that not only allows you to save, magnify and print parts of the screen but also distort and twist the shape into any other.



Blinker-64 / Information Development Systems/£29.98.

Blinker-64 is an invaluable utility for basic programmers and allows you to write programs using existing subroutines that you have already written, tested and debugged on disk. When you've completed the program, Blinker-64 puts in the routines and reassembles the program and presents a full on screen report including the start and end addresses and the number of modules used.

The Ray Shop / Precision Software/£19.98.

28 working ray models that can be printed out and then built are included on one disk, along with full instruction manual and handy extra components such as small pieces of cloth, rubber stripping and balloons. This may sound a bit like Blue Peter and a bit pointless but it is actually great fun. This could send the paper aeroplane industry to new heights. It

Listings

Get it right first time with our deluxe program system
for the C64.

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the fancy numbers by the side of each line of the listing. First of all, no, it's all part of our new style and

Instead of these messy graphs and rows of countless spaces in PRIN1 statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll now learn to decipher their meaning.

For example, [SA] would mean type in a Shifted A_1 , or an ace of spades in layman's terms, and [SA, 10] would mean a row of ten of these symbols.

[C+I] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realize that [C+2] means exactly the same thing except that the Command key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. Translated into English this means print the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:
CTRL N, DOWN2,LEFT5,BLUE,
EUCH

This would be achieved by the following:

down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2 would of course make the computer believe its broken).

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:

In this case the two characters should have a common between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT + ") and delete it. This puts the computer out of quote mode. Hold down CTRL, and press the number nine key (RTN9000), type the relevant number of reserved Ts and then hold down CTRL, and press one (RTN001). Next type another quotation mark and delete it again. Now finish the line and use RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string: the symbol for pi. This may appear when its value is needed in a calculation so this may look something like:

01-01-2000

Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the \uparrow symbol).

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

[illegible][illegible]

THE BUREAU OF THE
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[illegible][illegible]

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Key Takeaways

Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk

immediately because it will be used with most of the present and future listings appearing in *Your Commodore*.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and


press RETURN again.

















If you want to turn off the checker simply type STOPH32 and the screen will return to the familiar blue screen. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same STOP command.

Lower Case

Many of the listings are presented in lower case. To turn your computer to lower case mode press the Commodore key and the SHIFT key at the same time.

TS

Mnemonic	Symbol	Keypress
[RIGHT]		CRSR left/right
[LEFT]		SHIFT & CRSR left/right
[DOWN]		CRSR up/down
[UP]		SHIFT & CRSR up/down
[F1]		F1 key
[F2]		SHIFT & F1 key
[F3]		F3 key
[F4]		SHIFT & F3 key
[F5]		F5 key
[F6]		SHIFT & F5 key
[F7]		F7 key
[F8]		SHIFT & F7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 9

Mnemonic	Symbol	Keypress
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[FOUND]		F
[LARRROW]		←
[UPARROW]		↑
[P1]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		see text
[Clear]		CRM + letter
[Store]		SHIFT + letter

YOUTH COMPANIONS January

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YOUR COMPANY'S *Business* **PROFITABILITY**

LISTINGS

[illegible]

LISTINGS

	6,289,5,181,185,223,223,223 7,169,7,2754	AC 2125 DAT825,24,32,248,223,172 179,7,33,180,24,44,260,18,2 81,5,1558	74,5,74,80,24,24,173,174,2,1 85,188,1749
AE 2425 DAT8124,228,224,248,140 148,202,222,2,220,2,2,8,0,0 0,2200	AD 2125 DAT8240,20,203,2,240,24 148,88,240,20,32,24,173,88, 200,221,1540	DE 2425 DAT8141,174,2,173,174,2 240,173,2,268,8,248,0,142,1 75,2,2749	
AF 2425 DAT87,247,7,31,31,31,63 43,234,208,220,220,220,220, 225,224,2249	AE 2125 DAT8148,20,32,30,171,88 148,10,248,20,32,30,173,88, 200,21,1437	EE 2425 DAT8173,173,2,240,45,32 87,26,242,30,180,8,24,32,24 0,252,1547	
AG 2425 DAT80,70,189,219,229,19 7,24,208,127,228,220,225,225, 225,224,127,2000	AF 2125 DAT825,20,32,30,171,88 148,8,141,124,2,169,147,88, 225,222,1780	EF 2425 DAT8189,87,188,18,32,30 171,182,31,240,0,24,31,240, 225,200,1905	
AH 2425 DAT823,223,221,220,221 228,228,228,228,225,225,225, 225,0,0,2478	AG 2125 DAT8169,8,141,32,208,14 8,12,241,30,200,149,85,141,2 4,200,32,1713	EG 2425 DAT820,189,37,12,32,17 1,32,159,28,249,0,173,171,2, 32,11,1204	
AI 2425 DAT8181,221,222,222,222 7,149,7,228,228,224,248,248, 248,225,222,2199	AH 2125 DAT848,24,32,73,24,32, 210,24,32,142,24,142,5,200,0, 2,24,2128	EH 2425 DAT827,84,32,37,23,183, 21,189,8,24,32,240,200,249,0, 8,200,1503	
AL 2425 DAT80,225,8,0,0,0,8,0,7 247,7,31,31,31,43,43,738	AI 2125 DAT827,248,208,189,193, 189,20,32,30,171,149,8,52,37, 24,148,1233	FI 2425 DAT8128,32,30,173,88,189 225,140,175,2,32,37,29,143, 2480,2250	
AM 2425 DAT824,225,225,225,225, 228,220,224,8,0,128,270,185 119,128,225,2427	AJ 2125 DAT827,148,8,4,24,182,1 8,0,8,0,24,32,148,225,149,15 2,148,2433	FF 2425 DAT8174,24,189,8,32,21,2 1,189,31,32,218,225,149,82,9 1,212,1479	
AN 2425 DAT8127,225,225,225,225, 225,225,127,225,225,225,221 225,224,220,224,27393	AK 2125 DAT827,32,30,171,149,18, 149,172,8,149,198,200,27,32, 30,171,1239	FG 2425 DAT8173,171,2,32,11,27, 86,142,31,240,25,24,30,240,2 32,173,1830	
AO 2425 DAT825,225,225,225,225, 225,225,225,191,223,223,223 7,24777,2042	AL 2125 DAT820,170,2,208,244,1 68,179,188,37,12,30,173,88,1 82,18,240,2094	GH 2425 DAT818,24,189,8,32,21,2 1,189,31,32,218,225,149,82,9 1,212,1479	
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LISTINGS

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26	311 DATA100.143.13.77.3.84.7 3.55.9	57	365 DATA146.78.114.184.200.3 5.109.208.2
28	312 DATA41.33.241.77.3.104.4 3.42.2	58	366 DATA5.30.201.184.76.32.3 64.756
29	313 DATA112.74.74.74.74.170. 189.74.7	59	367 DATA31.148.208.8.32.323 1044.1012
30	314 DATA113.143.13.77.3.84.8 .493	60	368 DATA79.181.183.76.181.18 3.32.932
31	315 DATA16.32.48.3.32.64.80. 354	61	369 DATA120.183.248.0.141.48 3.692
32	316 DATA64.66.32.48.66.132.8 4.484	62	370 DATA38.66.3.173.66.3.32 .883
33	317 DATA68.32.318.0.32.138.3 73.573	63	371 DATA18.182.32.59.193.17 3.64.933
34	318 DATA88.71.72.183.72.72. 32.648	64	372 DATA1.100.64.3.208.208.4 6.073
35	319 DATA113.3.32.136.173.682 71.684	65	373 DATA142.138.322.208.273. 84.932.1341
36	320 DATA73.185.72.72.32.115. 0.528	66	374 DATA5.149.17.177.251.136 148.948
37	321 DATA32.188.173.32.248.17 3.183.855	67	375 DATA351.208.180.284.65.5 7.44.1037
38	322 DATA73.133.108.183.72.13 3.118.785	68	376 DATA148.138.148.183.148. 251.96.1391
39	323 DATA184.103.183.104.133. 187.204.793	69	377 DATA40.74.3.208.204.82. 3.489
40	324 DATA123.106.104.133.188. 189.1.742	70	378 DATA40.16.173.85.3.108. 238.788
41	325 DATA177.107.141.64.3.168 3.483	71	379 DATA77.281.280.148.283. 136.204.1364
42	326 DATA177.108.141.76.3.148 3.895.774	72	380 DATA124.3.208.244.173.74. 3.774
43	327 DATA141.88.3.248.188.141 69.693	73	381 DATA149.183.243.231.86.3 3.120.873
44	328 DATA182.187.142.73.2.3 45.684	74	382 DATA183.189.8.141.64.3.2 38.803
45	329 DATA189.143.71.3.183.108 1461.738	75	383 DATA8.3.173.64.3.32.218 361
46	330 DATA73.3.189.118.141.73. 3.267	76	384 DATA73.183.3.248.32.248 3.823.847
47	331 DATA66.170.10.34.189.48. 3.469	77	385 DATA208.284.85.3.208.248 7.42.2151
48	332 DATA133.103.169.0.108.88 3.888	78	386 DATA8.3.208.44.3.208.27 3.774
49	333 DATA123.108.183.10.24.18 8.76.882	79	387 DATA8.0.8.0.0.0.0.0.0.0
50	334 DATA13.133.107.189.3.208. 71.393	80	
51	335 DATA3.133.108.138.143.74 3.882	81	100 REM *****
52	336 DATA10.34.108.74.3.24.18 8.383	82	101 REM ** SET UP MONDAY DATA
53	337 DATA73.3.133.169.189.0.1 89.393	83	102 REM *****
54	338 DATA73.3.133.118.240.1.1 77.697	84	103 DATA130.131.133.131.131
55	339 DATA123.133.131.133.203. 24.136.1036	85	104 DATA11.18.481.18.508.18
56	340 DATA77.183.185.4.183.15 3.24.882	86	105 DATA18.42.24.34
57	341 DATA108.212.183.284.208. 577.187.3168	87	106 DATA172.19.781.19.881.19
58	342 DATA61.48.3.183.8.177.1 89.688	88	107 DATA11.18.481.18.508.18
59	343 DATA41.48.3.208.277.189 133.882	89	108 DATA172.19.781.19.881.19
60	344 DATA108.180.177.189.133. 103.76.816	90	109 DATA11.18.481.18.508.18
61	345 DATA73.66.3.138.182.283 144.1063	91	110 REM *****
62	346 DATA87.177.231.202.32.34 0.348.1383	92	111 REM ** SET UP EXAMPLE DA
63	347 DATA208.140.67.3.153.52. 112.739	93	112 REM *****
64	348 DATA188.180.8.277.251.12 89.683	94	113 DATA11.18.481.18.508.18
65	349 DATA1.143.96.208.244.4 7.3.989	95	114 DATA11.18.481.18.508.18
66	350 DATA208.243.148.8.173.87 3.874	96	115 REM *****
67	351 DATA40.189.208.183.96.1 40.108.971	97	116 DATA11.18.481.18.508.18
68	352 DATA208.243.148.8.173.87 3.874	98	117 DATA11.18.481.18.508.18
69	353 DATA11.18.481.18.508.18	99	118 DATA11.18.481.18.508.18
70	354 DATA11.18.481.18.508.18	100	119 DATA11.18.481.18.508.18
71	355 DATA11.18.481.18.508.18	101	120 DATA11.18.481.18.508.18
72	356 DATA11.18.481.18.508.18	102	121 DATA11.18.481.18.508.18
73	357 DATA11.18.481.18.508.18	103	122 DATA11.18.481.18.508.18
74	358 DATA11.18.481.18.508.18	104	123 DATA11.18.481.18.508.18
75	359 DATA11.18.481.18.508.18	105	124 DATA11.18.481.18.508.18
76	360 DATA11.18.481.18.508.18	106	125 DATA11.18.481.18.508.18
77	361 DATA11.18.481.18.508.18	107	126 DATA11.18.481.18.508.18
78	362 DATA11.18.481.18.508.18	108	127 DATA11.18.481.18.508.18
79	363 DATA11.18.481.18.508.18	109	128 DATA11.18.481.18.508.18
80	364 DATA11.18.481.18.508.18	110	129 DATA11.18.481.18.508.18
81	365 DATA11.18.481.18.508.18	111	130 DATA11.18.481.18.508.18
82	366 DATA11.18.481.18.508.18	112	131 DATA11.18.481.18.508.18
83	367 DATA11.18.481.18.508.18	113	132 DATA11.18.481.18.508.18
84	368 DATA11.18.481.18.508.18	114	133 DATA11.18.481.18.508.18
85	369 DATA11.18.481.18.508.18	115	134 DATA11.18.481.18.508.18
86	370 DATA11.18.481.18.508.18	116	135 DATA11.18.481.18.508.18
87	371 DATA11.18.481.18.508.18	117	136 DATA11.18.481.18.508.18
88	372 DATA11.18.481.18.508.18	118	137 DATA11.18.481.18.508.18
89	373 DATA11.18.481.18.508.18	119	138 DATA11.18.481.18.508.18
90	374 DATA11.18.481.18.508.18	120	139 DATA11.18.481.18.508.18
91	375 DATA11.18.481.18.508.18	121	140 DATA11.18.481.18.508.18
92	376 DATA11.18.481.18.508.18	122	141 DATA11.18.481.18.508.18
93	377 DATA11.18.481.18.508.18	123	142 DATA11.18.481.18.508.18
94	378 DATA11.18.481.18.508.18	124	143 DATA11.18.481.18.508.18
95	379 DATA11.18.481.18.508.18	125	144 DATA11.18.481.18.508.18
96	380 DATA11.18.481.18.508.18	126	145 DATA11.18.481.18.508.18
97	381 DATA11.18.481.18.508.18	127	146 DATA11.18.481.18.508.18
98	382 DATA11.18.481.18.508.18	128	147 DATA11.18.481.18.508.18
99	383 DATA11.18.481.18.508.18	129	148 DATA11.18.481.18.508.18
100	384 DATA11.18.481.18.508.18	130	149 DATA11.18.481.18.508.18

LISTINGS

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LISTINGS

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PROBATION, 1991-1992

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000 100 PRINT "*****"
001 *****
002 200 INPUT "ENTER LIBRARY NAME";
003 N$
004 300 INPUT "ENTER DATE";
005 *****
006 400 PRINT "LIBRARY NAME: ", N$
007 *****
008 500 PRINT "DATE: ", D$
009 *****
010 600 FOR I=1 TO 1000: GOTO 1100
011 700 PRINT "I="; I; "N="; N$; "D="; D$
012 800 GOTO 1100
013 900 GOTO 1100
014 1000 PRINT "LIBRARY NAME: ", N$
015 1100 PRINT "DATE: ", D$
016 1200 PRINT "LIBRARY NAME: ", N$
017 1300 PRINT "DATE: ", D$
018 1400 PRINT "LIBRARY NAME: ", N$
019 1500 PRINT "DATE: ", D$
020 1600 PRINT "LIBRARY NAME: ", N$
021 1700 PRINT "DATE: ", D$
022 1800 PRINT "LIBRARY NAME: ", N$
023 1900 PRINT "DATE: ", D$
024 2000 PRINT "LIBRARY NAME: ", N$
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175 17100 PRINT "DATE: ", D$
176 17200 PRINT "LIBRARY NAME: ", N$
177 17300 PRINT "DATE: ", D$
178 17400 PRINT "LIBRARY NAME: ", N$
179 17500 PRINT "DATE: ", D$
180 17600 PRINT "LIBRARY NAME: ", N$
181 17700 PRINT "DATE: ", D$
182 17800 PRINT "LIBRARY NAME: ", N$
183 17900 PRINT "DATE: ", D$
184 18000 PRINT "LIBRARY NAME: ", N$
185 18100 PRINT "DATE: ", D$
186 18200 PRINT "LIBRARY NAME: ", N$
187 18300 PRINT "DATE: ", D$
188 18400 PRINT "LIBRARY NAME: ", N$
189 18500 PRINT "DATE: ", D$
190 18600 PRINT "LIBRARY NAME: ", N$
191 18700 PRINT "DATE: ", D$
192 18800 PRINT "LIBRARY NAME: ", N$
193 18900 PRINT "DATE: ", D$
194 19000 PRINT "LIBRARY NAME: ", N$
195 19100 PRINT "DATE: ", D$
196 19200 PRINT "LIBRARY NAME: ", N$
197 19300 PRINT "DATE: ", D$
198 19400 PRINT "LIBRARY NAME: ", N$
199 19500 PRINT "DATE: ", D$
200 19600 PRINT "LIBRARY NAME: ", N$
201 19700 PRINT "DATE: ", D$
202 19800 PRINT "LIBRARY NAME: ", N$
203 19900 PRINT "DATE: ", D$
204 20000 PRINT "LIBRARY NAME: ", N$
205 20100 PRINT "DATE: ", D$
206 20200 PRINT "LIBRARY NAME: ", N$
207 20300 PRINT "DATE: ", D$
208 20400 PRINT "LIBRARY NAME: ", N$
209 20500 PRINT "DATE: ", D$
210 20600 PRINT "LIBRARY NAME: ", N$
211 20700 PRINT "DATE: ", D$
212 20800 PRINT "LIBRARY NAME: ", N$
213 20900 PRINT "DATE: ", D$
214 21000 PRINT "LIBRARY NAME: ", N$
215 21100 PRINT "DATE: ", D$
216 21200 PRINT "LIBRARY NAME: ", N$
217 21300 PRINT "DATE: ", D$
218 21400 PRINT "LIBRARY NAME: ", N$
219 21500 PRINT "DATE: ", D$
220 21600 PRINT "LIBRARY NAME: ", N$
221 21700 PRINT "DATE: ", D$
222 21800 PRINT "LIBRARY NAME: ", N$
223 21900 PRINT "DATE: ", D$
224 22000 PRINT "LIBRARY NAME: ", N$
225 22100 PRINT "DATE: ", D$
226 22200 PRINT "LIBRARY NAME: ", N$
227 22300 PRINT "DATE: ", D$
228 22400 PRINT "LIBRARY NAME: ", N$
229 22500 PRINT "DATE: ", D$
230 22600 PRINT "LIBRARY NAME: ", N$
231 22700 PRINT "DATE: ", D$
232 22800 PRINT "LIBRARY NAME: ", N$
233 22900 PRINT "DATE: ", D$
234 23000 PRINT "LIBRARY NAME: ", N$
235 23100 PRINT "DATE: ", D$
236 2
```

Downloaded from <http://ajph.org/> at University of California, San Diego on June 11, 2015

- 1) Enter the program "SYSTEM.BAS"
- 2) Save it as tape or disk.
DO NOT RUN IT.
- 3) Enter the following command:
`PAGE 0,0:FORGET,10:FORWARD,0`
END
- 4) Now LOAD and RUN "SYSTEM.BAS"
- 5) When finished enter the follow-
ing command: `FORGET,0:RUN`

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26

[illegible][illegible]

LISTINGS

[illegible]

LISTINGS

80 1470 RETURN	4000 DIRECTOR OFFICIALS	10700 RETURN
81 1475 NEXT	4010 IF NOT END	10800 RETURN
82 1480 RETURN	4020 PRINT "PRINTING OFFICIALS"	10900 RETURN
83 1485 RETURN	4030 IF NOT END	11000 RETURN
84 1490 RETURN	4040 PRINT "PRINTING OFFICIALS"	11100 RETURN
85 1495 RETURN	4050 IF NOT END	11200 RETURN
86 1500 RETURN	4060 PRINT "PRINTING OFFICIALS"	11300 RETURN
87 1505 RETURN	4070 IF NOT END	11400 RETURN
88 1510 RETURN	4080 PRINT "PRINTING OFFICIALS"	11500 RETURN
89 1515 RETURN	4090 IF NOT END	11600 RETURN
90 1520 RETURN	4100 PRINT "PRINTING OFFICIALS"	11700 RETURN
91 1525 RETURN	4110 IF NOT END	11800 RETURN
92 1530 RETURN	4120 PRINT "PRINTING OFFICIALS"	11900 RETURN
93 1535 RETURN	4130 IF NOT END	12000 RETURN
94 1540 RETURN	4140 PRINT "PRINTING OFFICIALS"	12100 RETURN
95 1545 RETURN	4150 IF NOT END	12200 RETURN
96 1550 RETURN	4160 PRINT "PRINTING OFFICIALS"	12300 RETURN
97 1555 RETURN	4170 IF NOT END	12400 RETURN
98 1560 RETURN	4180 PRINT "PRINTING OFFICIALS"	12500 RETURN
99 1565 RETURN	4190 IF NOT END	12600 RETURN
100 1570 RETURN	4200 PRINT "PRINTING OFFICIALS"	12700 RETURN
101 1575 RETURN	4210 IF NOT END	12800 RETURN
102 1580 RETURN	4220 PRINT "PRINTING OFFICIALS"	12900 RETURN
103 1585 RETURN	4230 IF NOT END	13000 RETURN
104 1590 RETURN	4240 PRINT "PRINTING OFFICIALS"	13100 RETURN
105 1595 RETURN	4250 IF NOT END	13200 RETURN
106 1600 RETURN	4260 PRINT "PRINTING OFFICIALS"	13300 RETURN
107 1605 RETURN	4270 IF NOT END	13400 RETURN
108 1610 RETURN	4280 PRINT "PRINTING OFFICIALS"	13500 RETURN
109 1615 RETURN	4290 IF NOT END	13600 RETURN
110 1620 RETURN	4300 PRINT "PRINTING OFFICIALS"	13700 RETURN
111 1625 RETURN	4310 IF NOT END	13800 RETURN
112 1630 RETURN	4320 PRINT "PRINTING OFFICIALS"	13900 RETURN
113 1635 RETURN	4330 IF NOT END	14000 RETURN
114 1640 RETURN	4340 PRINT "PRINTING OFFICIALS"	14100 RETURN
115 1645 RETURN	4350 IF NOT END	14200 RETURN
116 1650 RETURN	4360 PRINT "PRINTING OFFICIALS"	14300 RETURN
117 1655 RETURN	4370 IF NOT END	14400 RETURN
118 1660 RETURN	4380 PRINT "PRINTING OFFICIALS"	14500 RETURN
119 1665 RETURN	4390 IF NOT END	14600 RETURN
120 1670 RETURN	4400 PRINT "PRINTING OFFICIALS"	14700 RETURN
121 1675 RETURN	4410 IF NOT END	14800 RETURN
122 1680 RETURN	4420 PRINT "PRINTING OFFICIALS"	14900 RETURN
123 1685 RETURN	4430 IF NOT END	15000 RETURN
124 1690 RETURN	4440 PRINT "PRINTING OFFICIALS"	15100 RETURN
125 1695 RETURN	4450 IF NOT END	15200 RETURN
126 1700 RETURN	4460 PRINT "PRINTING OFFICIALS"	15300 RETURN
127 1705 RETURN	4470 IF NOT END	15400 RETURN
128 1710 RETURN	4480 PRINT "PRINTING OFFICIALS"	15500 RETURN
129 1715 RETURN	4490 IF NOT END	15600 RETURN
130 1720 RETURN	4500 PRINT "PRINTING OFFICIALS"	15700 RETURN
131 1725 RETURN	4510 IF NOT END	15800 RETURN
132 1730 RETURN	4520 PRINT "PRINTING OFFICIALS"	15900 RETURN
133 1735 RETURN	4530 IF NOT END	16000 RETURN
134 1740 RETURN	4540 PRINT "PRINTING OFFICIALS"	16100 RETURN
135 1745 RETURN	4550 IF NOT END	16200 RETURN
136 1750 RETURN	4560 PRINT "PRINTING OFFICIALS"	16300 RETURN
137 1755 RETURN	4570 IF NOT END	16400 RETURN
138 1760 RETURN	4580 PRINT "PRINTING OFFICIALS"	16500 RETURN
139 1765 RETURN	4590 IF NOT END	16600 RETURN
140 1770 RETURN	4600 PRINT "PRINTING OFFICIALS"	16700 RETURN
141 1775 RETURN	4610 IF NOT END	16800 RETURN
142 1780 RETURN	4620 PRINT "PRINTING OFFICIALS"	16900 RETURN
143 1785 RETURN	4630 IF NOT END	17000 RETURN
144 1790 RETURN	4640 PRINT "PRINTING OFFICIALS"	17100 RETURN
145 1795 RETURN	4650 IF NOT END	17200 RETURN
146 1800 RETURN	4660 PRINT "PRINTING OFFICIALS"	17300 RETURN
147 1805 RETURN	4670 IF NOT END	17400 RETURN
148 1810 RETURN	4680 PRINT "PRINTING OFFICIALS"	17500 RETURN
149 1815 RETURN	4690 IF NOT END	17600 RETURN
150 1820 RETURN	4700 PRINT "PRINTING OFFICIALS"	17700 RETURN
151 1825 RETURN	4710 IF NOT END	17800 RETURN
152 1830 RETURN	4720 PRINT "PRINTING OFFICIALS"	17900 RETURN
153 1835 RETURN	4730 IF NOT END	18000 RETURN
154 1840 RETURN	4740 PRINT "PRINTING OFFICIALS"	18100 RETURN
155 1845 RETURN	4750 IF NOT END	18200 RETURN
156 1850 RETURN	4760 PRINT "PRINTING OFFICIALS"	18300 RETURN
157 1855 RETURN	4770 IF NOT END	18400 RETURN
158 1860 RETURN	4780 PRINT "PRINTING OFFICIALS"	18500 RETURN
159 1865 RETURN	4790 IF NOT END	18600 RETURN
160 1870 RETURN	4800 PRINT "PRINTING OFFICIALS"	18700 RETURN
161 1875 RETURN	4810 IF NOT END	18800 RETURN
162 1880 RETURN	4820 PRINT "PRINTING OFFICIALS"	18900 RETURN
163 1885 RETURN	4830 IF NOT END	19000 RETURN
164 1890 RETURN	4840 PRINT "PRINTING OFFICIALS"	19100 RETURN
165 1895 RETURN	4850 IF NOT END	19200 RETURN
166 1900 RETURN	4860 PRINT "PRINTING OFFICIALS"	19300 RETURN
167 1905 RETURN	4870 IF NOT END	19400 RETURN
168 1910 RETURN	4880 PRINT "PRINTING OFFICIALS"	19500 RETURN
169 1915 RETURN	4890 IF NOT END	19600 RETURN
170 1920 RETURN	4900 PRINT "PRINTING OFFICIALS"	19700 RETURN
171 1925 RETURN	4910 IF NOT END	19800 RETURN
172 1930 RETURN	4920 PRINT "PRINTING OFFICIALS"	19900 RETURN
173 1935 RETURN	4930 IF NOT END	20000 RETURN
174 1940 RETURN	4940 PRINT "PRINTING OFFICIALS"	20100 RETURN
175 1945 RETURN	4950 IF NOT END	20200 RETURN
176 1950 RETURN	4960 PRINT "PRINTING OFFICIALS"	20300 RETURN
177 1955 RETURN	4970 IF NOT END	20400 RETURN
178 1960 RETURN	4980 PRINT "PRINTING OFFICIALS"	20500 RETURN
179 1965 RETURN	4990 IF NOT END	20600 RETURN
180 1970 RETURN	5000 PRINT "PRINTING OFFICIALS"	20700 RETURN
181 1975 RETURN	5010 IF NOT END	20800 RETURN
182 1980 RETURN	5020 PRINT "PRINTING OFFICIALS"	20900 RETURN
183 1985 RETURN	5030 IF NOT END	21000 RETURN
184 1990 RETURN	5040 PRINT "PRINTING OFFICIALS"	21100 RETURN
185 1995 RETURN	5050 IF NOT END	21200 RETURN
186 2000 RETURN	5060 PRINT "PRINTING OFFICIALS"	21300 RETURN
187 2005 RETURN	5070 IF NOT END	21400 RETURN
188 2010 RETURN	5080 PRINT "PRINTING OFFICIALS"	21500 RETURN
189 2015 RETURN	5090 IF NOT END	21600 RETURN
190 2020 RETURN	5100 PRINT "PRINTING OFFICIALS"	21700 RETURN
191 2025 RETURN	5110 IF NOT END	21800 RETURN
192 2030 RETURN	5120 PRINT "PRINTING OFFICIALS"	21900 RETURN
193 2035 RETURN	5130 IF NOT END	22000 RETURN
194 2040 RETURN	5140 PRINT "PRINTING OFFICIALS"	22100 RETURN
195 2045 RETURN	5150 IF NOT END	22200 RETURN
196 2050 RETURN	5160 PRINT "PRINTING OFFICIALS"	22300 RETURN
197 2055 RETURN	5170 IF NOT END	22400 RETURN
198 2060 RETURN	5180 PRINT "PRINTING OFFICIALS"	22500 RETURN
199 2065 RETURN	5190 IF NOT END	22600 RETURN
200 2070 RETURN	5200 PRINT "PRINTING OFFICIALS"	22700 RETURN

LATINOS

[illegible]

REL/256 512	STA HI.VEC	704 PAGE	JMP HEAD JMP/256	560 512 520	ORG #B04 STS #B000 (SET INDEX
TOR 528	LEA #B001E	D LINE 720-832		530	RAFT SECTION FOR SECOND SPLIT
530	STA BACCON			540	LEA #B001
540	LEA #B01			550	STS LO.REC
550	STA VICTOR			560	LEA #B001
560	JMP #B001			570	STS HI.REC
570				580	
580				590	LEA #B001E
590	(JMP FIB 18			600	LEA #B001E
AT HERE (INCREASE/DECREASE FOR VS				610	LEA #B001E
ON MACHINE				620	LEA #B001E
630	ROUTINE2			630	ROUTINE2
640	ROUTINE2			640	ROUTINE2
650	ROUTINE2			650	ROUTINE2
660	ROUTINE2			660	ROUTINE2
670	ROUTINE2			670	ROUTINE2
680	ROUTINE2			680	ROUTINE2
690	ROUTINE2			690	ROUTINE2
700	ROUTINE2			700	ROUTINE2
710	ROUTINE2			710	ROUTINE2
720	ROUTINE2			720	ROUTINE2
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860	ROUTINE2			860	ROUTINE2
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880	ROUTINE2			880	ROUTINE2
890	ROUTINE2			890	ROUTINE2
900	ROUTINE2			900	ROUTINE2
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950	ROUTINE2			950	ROUTINE2
960	ROUTINE2			960	ROUTINE2
970	ROUTINE2			970	ROUTINE2
980	ROUTINE2			980	ROUTINE2
990	ROUTINE2			990	ROUTINE2

LISTINGS

1000	ATA 10000.
F	
1000	LSA 10000.
F	
1000	ATA 10000.
F	
1000	LSA 10000.
F	
1000	ATA 10000.
F	
1070	107
1000	000
1000	1000000000
T (CHARACTER ROM	
1000	LSA 000
1000	000 00000
1000	ATA 000
1000	000

PROBLEM: LOST IN 4
PROBLEM: WHITE LADDER

75	0	DATA	1000,	00,	1000,	1000,	10
76	0	01,	141,	13,			
77	1	DATA	0000,	0001,	00,	0001,	17
78	3	10,	0000,	170			
79	0	DATA	10,	0001,	170,	17,	0000
80			70,	107,	170		
81	3	DATA	17,	0000,	1000,	90,	170
82			000,	3,	1000		
83	0	DATA	1000,	1701,	01,	0,	1000
84			1,	101,	100		
85	0	DATA	0000,	0000,	00,	101,	10
86			0000,	00,	000		
87	0	DATA	1000,	7,	100,	00,	0000
88			101,	00,	0000		
89	0	DATA	1700,	00,	0000,	00,	0000
90			0,	0,	100		
91	0	DATA	001,	0000,	0000,	000,	100
92			000,	0,	0000		
93	0	DATA	1000,	100,	01,	0,	0000
94			1000,	101,	10		
95	10	DATA	0000,	1000,	1,	101,	00
96			0000,	0000,	0000,	0000,	0000
97	10	DATA	0000,	1000,	00,	1000,	0
98	0	0,	0000,	1000,			
99	10	DATA	0001,	00,	0,	1000,	100
100			101,	10,	0000		
101	10	DATA	1000,	0,	101,	00,	0000
102			1000,	00,	0000		
103	0	DATA	170,	00,	0000,	01,	00
104			00,	0,	100		
105	10	DATA	0000,	0000,	1000,	1,	100
106			0000,	0000,	00		
107	10	DATA	000,	0000,	1000,	1,	01,
108			0001,	100,	1		
109	17	DATA	0000,	0,	0000,	0,	0000
110			0000,	0,	00		
111	10	DATA	0000,	0,	0000,	1000,	0
112			07,	1000,	0		
113	00	DATA	010,	1000,	0,	00,	1000
114			0,	011,	100		
115	00		100,	1000,	0,	0100,	
116			1000,	0,	00		
117	00	DATA	1000,	0,	017,	0000,	0
118			0000,	1000,	0		
119	00	DATA	0100,	1000,	0,	000,	1000
120			0,	0000,	1000		
121	00	DATA	0,	07,	0000,	0000,	0000
122			1000,	1,	0		
123	00	DATA	0,	1000,	1,	000,	0
124	000	ADDRESS	10000-1000000000				
125	000	ADDRESS	1000000000-10000000000				
126	000	ADDRESS	10000000000-100000000000				
127	000	ADDRESS	100000000000-1000000000000				

FROM - 06-09-88 RTT - 17-09-88 / 11:00
TO - 06-09-88 FROM - 06-09-88

[illegible][illegible]

FILE NO.	DATE	TIME	TYPE
FILE NO.	DATE	TIME	TYPE

[illegible]

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